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A
M A N U A L :
OR,
AN EASY METHOD
OF
M A N A G I N G B E E S

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IN THE
MOST PROFITABLE MANNER TO THEIR OWNER:
WITH
INFALLIBLE RULES TO PREVENT THEIR DESTRUCTION BY THE MOTH.

BY JOHN M. WEEKS, OF VERMONT.

Second New Edition, Corrected, Revised, and Enlarged

WITH AN APPENDIX,
BY WOOSTER A. FLANDERS,
NORTHFIELD, VERMONT.

NEW YORK:
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PREFACE.

It appears to the writers of the following pages, that a work of this description is much needed in our country.

The cultivation of the bee (*Apis Mellifica*) has been too long neglected in most parts of the United States.

This general neglect has unquestionably originated from the fact that the European enemy to the bee, called the moth, has found its way into this country, and has located and naturalized itself here ; and it has made so much havoc among bees, that many districts have entirely abandoned their cultivation. Many apiarians, and men of the highest literary attainments as well as experience, have nearly exhausted their patience in examining the peculiar nature and habits of this insect ; and they have tried various experiments to devise some means of preventing its depredations. But, after all that has been done, the spoiler moves on with little molestation ; and very few of our citizens are willing to engage in the enterprise of cultivating this most useful and profitable of all insects, the honey-bee.

The following work is designed as a directory to those who are engaged in the cultivation of bees, and is divided into chapters and sections, with the intention to facilitate their management in all their different stages, so that any person, properly situated, may cultivate bees, and avail himself of all the benefits of their labors.

If the apiarian manages strictly in accordance with the following directions, the authors feel confident that no colony will ever materially suffer by the moth, or will ever be destroyed by it.

The authors are aware of the numerous treatises published on this subject ; but they appear to them for the most part to be the result not so much of experience as of vague and conjectural speculation, and not sufficiently embodying what is practical and useful.

This work is intended as an accompaniment to all our hives, and is the result of observation and experience, and, it is thought, comprises all that is necessary to make a skilful apiarian.

THE AUTHORS.

PREFACE TO THE SECOND NEW EDITION.

As there are so many writers on bees at the present day, it has appeared to the writer of this work that another edition of this is hardly needed; and having already sold over twenty thousand of them, I had concluded, in case the public demanded it, to publish a much larger work; but at present the demand appears to be more for a new edition than for a much larger treatise, and I have concluded to revise and enlarge the last edition a little, and let it come before the public for what it is worth.

J. M. WEEKES.

West Farms, Salisbury, March 1, 1854.

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FLANDERS' PATENT BEE HIVE,

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(See Appendix.)

MANUAL.

CHAPTER I.

OF THE CONSTRUCTION OF A BEE-HIVE.

A BEE-HIVE should be made of sound boards, free from shakes and cracks: it should also be planed smooth, inside and out, made in a workmanlike manner, and painted white on its outside.

REMARKS.

That a bee-hive should be made perfect, so as to exclude light and air, is obvious from the fact that the bees will finish what the workman has neglected, by plastering up all such cracks and crevices, or bad joints, as are left open by the joiner. The substance they use for this purpose is neither honey nor wax, but a kind of glue, or cement, of their own manufacturing, and is used by the bees to fill up all imperfect joints, and exclude all light and air. This cement or glue is made principally of gums taken from forest trees and fruit trees that yield it, and, when worked over and formed into cement by the bees, is very congenial to the growth of the moth, in the first stages of its existence.

The moth-miller enters the hive generally in the night, makes an incision into the glue, or cement, with her sting, and leaves her eggs deposited in the glue, where they remain

secure from the bees, being guarded by the timber on their sides. Thus, while a maggot, (*larva*,) the moth uses the cement for food until it arrives so far towards a state of maturity as to be able to spin a web, which is more fully explained in Chapter X.

The size of a hive should be in accordance with the strictest rules of economy, and adapted to the peculiar nature and economy of the honey-bee, in order to make them profitable to their owner.

The lower apartment of the hive, where they store their food, raise their young bees, and perform their ordinary labors, should hold as much as a box of thirteen inches and one half, or fourteen inches square, or one bushel. This size cannot safely be deviated from to any considerable degree, for reasons drawn from the following facts, which will be considered more in detail in the course of the work.

Nature has fixed certain principles in the peculiar instinct of the honey-bee, which are unalterable by human wisdom. (See General Observations.)

If the hive is much larger than the one already described, the bees cannot work to advantage, and will not be likely to fill the drawers in several years, if they swarm; and their prosperity depends principally on swarming, for it is their nature to do so; and any management which counteracts their natural habits impedes them in their labors, and renders them of little profit to their owner; and they finally run out, or come to an end, in a few years.

Bees in large hives never swarm; and those in hives much less than the one already described, do but little else than raise young bees, and lay up a sufficient quantity of food to supply them through the coming winter, and are more liable to be robbed, and perish in the winter for want of animal heat.

All hives of bees that swarm are liable to swarm too much, and reduce their colonies so low in numbers as to materially injure them, which is frequently the cause of their destruction by the moth, and is more particularly explained in Chapters II. and X.

The chamber of the hive should hold about one-third as much as the lower apartment, and be made perfectly tight, so as to exclude all light from the windows of the drawers; and also to protect them from the chilly night air: otherwise, the cold air of night so alters the condition of the animal heat in the drawer, that the bees are compelled to lie in idleness until an equilibrium can be formed in the box the following day. Bees make comb in the night, and fill up the cells with honey in the daytime. Comb is made of honey, ruminated in the stomach of the working bee: it exudes from the interior of its abdomen, and forms in little flakes between its folds, and is taken by the bees in their mouths from thence, and welded on to enlarge the cells and fill up their tenement with comb. Now, as it requires an exact uniformity of heat, in all cases, to make comb and enlarge the cells of a colony, we are able to account for the fact that bees will store much more honey in drawers than in *caps*, which are more exposed to the cold and damp air of night.

Drawers should be small, like Nos. 2, 4, and 8, for all purposes, except such as are used for multiplying colonies and transferring swarms, which should always be large, like No. 1. No 1 drawer fills the chamber of the hive, is 14 inches long, $12\frac{1}{2}$ inches wide, and $5\frac{1}{2}$ inches high on its outside when finished, and should be made to play half inch above and sidewise in the chamber, to facilitate its removal when swollen by the damp vapor of the bees. No. 2 drawers are most profitable for common use, and are half the size of No. 1.

Hives should have cleats on their sides, so as to suspend them in the air, some distance from the floor of the apiary, the better to secure the bees from destruction by the mice, reptiles, and vermin.

The back side or rear of the lower apartment of the hive, should slant forward, so as to render the same smallest at the bottom, the better to secure the combs from falling when cracked by frost, or nearly melted in hot weather.

No timbers or boards should be placed very near the lower edge of the hive, because it facilitates the entrance of depredators. That the back side should slant forward is obvious, from the fact that bees generally rest one edge of their comb on that side, and build towards the front in such a manner as to enter upon the same sheet where they intend to deposit their stores, when they first enter the hive, without being compelled to take any unnecessary steps.

The bottom of the hive should slant downward from rear to front, so as to afford the greatest facility to the bees to clear their tenement of all offensive substances, and let the water, which is occasioned by the breath and vapor of the bees, run off in cold weather. It also aids the bees very much in preventing the entrance of robbers.

The bottom board should be suspended by staples and hooks near each corner of the hive, in such a manner as to afford a free entrance and egress to the bees on all its sides, which will better enable them to keep their tenement clear of moths.

There should be a button attached to the lower edge of the rear of the hive, so as to enable the apiarian to govern the bottom board in such a manner as to give all the air they need, or close the hive at pleasure. We have for a number of years past used the Canal Bottom Board to the best advantage on all our hives. [See Fig. 4 in Appendix.]

The hive should have two sticks placed at equal distances from the chamber floor to its bottom, crossing each other at right angles, extending from the front corners to their most extreme rear, resting on the rear, with a screw driven through the front into the end of the stick which holds it fast in its place. It is found by experience that sticks are of essential use to a young swarm of bees, inasmuch as they depend greatly upon them to support their solid columns a little below the top of the hive, so as to exclude the air below from rushing up, while the bees raise that degree of animal heat necessary to the formation of comb, and attach it to the new wood. But few bees, in proportion to their whole number, can be employed in making comb when their labors are first commenced in a new habitation; and those which are engaged in this important and arduous business are compelled to retire for respiration and rest in a few minutes, and others take their places to perform the laborious and almost suffocating task. Thus, while the main colony are stationed a little back to exclude the air, and ruminate honey, which causes wax to grow, the reader will see the importance of something permanent for the bees to sustain themselves in their perilous situation, being every moment exposed, and liable to drop suddenly to the bottom of the hive, causing the greatest confusion and derangement in their perfect organization, by exposing their work to a current of fresh air, as well as the shock, which is painful to the bees, occasioned by the fall. Thus their whole business is broken up, until they can reorganize, and again exclude the air from their work, and resume their labors, when, all on a sudden, down goes the whole body of bees again in one general avalanche, and (to them) a tremendous crash, leaving their work again exposed, if not in ruins, by dragging a part, if not all, their new-made comb, already softened by animal heat for suc-

cessive layers, down along with them. The bees being often thus vexed, perplexed, and tormented, get discouraged, and flee to the woods for a more safe tenement. The little round old-fashioned sticks commonly used are surely better than none, because one of their principal uses is to sustain the weight of the bees at the time they are making new comb, instead of supporting themselves by the comb, where no dependence for strength ought to be placed. It is proper, then, that sticks should be made of inch boards, at least three inches wide in the centre, tapering towards each end nearly to a point, planed smooth, and scratched the under side, to enable the bees to hold fast. Every establishment of bees should be furnished with a number of bottom boards made and hung like common ones, with a hole through the centre of each, seven or eight inches square, and covered with wire screen, the meshes of which should be so small as to prevent the escape of any of the bees, so that, when attached to the hive, the common entrance may be closed in whole or in part, as the nature of the case may require, to prevent robbing, facilitating the removal of the bees to great distances without danger of suffocation, melting down, &c.

A hole five-eighths or three-fourths of an inch in diameter should be made near the top of the lower apartment of the hive, to let the excess of animal heat escape in the hottest weather, and also to serve as a ventilator, to let off the vapor of the bees, which frequently causes their death in the winter by freezing. [See directions for making hives in Appendix.]

The door to the chamber should be made to fit in the rabbetings of the same against the jambs, in such a manner as to exclude the light from the windows of the drawers, and also to prevent the entrance of the little ants. It should also be hung by butts, or fastened by a bar running vertically across the centre of the door, and confined by staples at each

end. The under side of the chamber floor should be planed smooth, then scratched with a sharp scratch, so as to raise little ridges, to enable the bees to hold fast, otherwise they may fall suddenly upon the bottom board, which may induce them to leave the hive and flee to the woods. That the inside of the hive should be made smooth is evident, from the fact that comb adheres much more firmly to a smooth board than it does to the small fibres or splinters which are left by the saw, and the comb is less likely to drop.

Some good managers of bees have recommended rubbing the inside of the sides of the hive with bees-wax, to enable the bees to hold fast until they had secured the comb at the top of the hive, where they always commence their labors. The old custom of washing the hives with salt and water, sweet herbs, and other substances, to give them a pleasant effluvia, should be abolished. Washing the hive swells the timber, and loosens the wax, more or less, where it is attached to the wood, and causes a greater effort on the part of the bees to commence their superstructure for new comb.

When bees die, the hive should be cleared of its contents, and scraped out, and the chamber rubbed with a cloth wet in clear water, then set in its place in the apiary, and there stand until wanted for use. An old hive, thus prepared, is better than a new one for the reception of a swarm of bees. The task, which is arduous and difficult, of attaching the comb to the new wood, in this case has been accomplished by the previous swarm.

Note.—It is found by experiment that the comb in all hives, under two years old, that are robbed, die of starvation, or otherwise, may be preserved for a new swarm, which forwards the labors of a new colony nearly half, if the comb remains in a good state of preservation. The apiarian, however, should be very minute in the examination of the

hive before using it, to see that there are no spiders' webs, or moths, which are exceeding wily and sly in all their habits, particularly in secreting their eggs from the notice of the bees. There is frequently some difficulty in making the necessary examination without breaking out a sheet of comb to examine at the top of the hive, for this is the place where the moths are usually found in the spring. The bees cluster in and about the lower edge of the comb and near the mouth of the hive during the moth season, to protect their tenement from that formidable enemy; but the chilly night air of autumn compels the bees to recede a little from the hive's entrance, and cluster in a body a little more firmly, in order to keep themselves warm, when in goes the *monster* in a "little corner sly," passes up to the top of the hive, and there, unobserved and unmolested, sows her seeds of rapine and plunder, and then retires to die. Now, as the moth-miller has entered her sting, left her eggs concealed from the bees leaving but a slight orifice, they are unobserved by the bees, until their animal heat has hatched them out in the winter, or early in spring: hence a swarm that has died in the winter may have moths that are not removed, and summer heat will be the only test by which the true condition of the comb can be certainly known. If the comb is in a good state of preservation, the bees avail themselves of a great advance profit, instead of retaining the honey in their sacks several days before they can empty them, for want of comb for storage: in this case, their burdens are at once relieved, and the bees are in the gardens, fields, and forests, collecting more of that precious treasure so conducive to their wants. But we shall say something more on this subject in its proper place.

There should be three sheet-iron or zinc slides, which answer for a whole establishment; one of which should be

nearly as wide as the chamber, and one or two inches longer than the length of the chamber. The other two should be the same length as the first, and half its width only.

All hives, and all their appendages, should be made exactly of a size and shape, in the same apiary. The trouble of equalizing colonies is far less than it is to accommodate hives to swarms. [See Appendix.] Much perplexity, and sometimes serious difficulties, occur, where the apiarian uses different-sized hives and drawers. But this part of the subject will be more fully discussed in its proper chapter.

A perfect snow-white is the best color for a bee-hive. All shades of colors are conductors of heat and cold, in proportion to their proximity towards a perfect black. It is better to let the hive remain the color of the wood than paint any shade of color, which may be the cause of melting the comb in summer, or freezing the bees in winter. To preserve the greatest uniformity of temperature in the hive, both summer and winter, the apiarian will find it for his interest to make all his hives of plank at least one and a half inch thick, or boards three-fourths of an inch thick, doubled in such a manner as to exclude insects from the joints.

CHAPTER II.

ON SWARMING AND HIVING.

THE apiarian, or bee-owner, should have his hives in readiness, and in their places in the apiary, with the drawers in their chambers, bottom up, so as to prevent entrance.

When a swarm comes forth, and has alighted, cut off the limb, if convenient; shake it gently, so as to disengage the bees, and let them fall gently on to the table, board, or ground, as the case may be; place the hive over them before many rise into the air, taking care at the same time to lay one or more sticks in such a manner as to raise the hive so as to give the bees rapid ingress and egress. If the bees act reluctantly in taking possession of their new habitation, disturb them by brushing them with a goose-quill or some other instrument, not harsh, and they will soon enter. In case it is found necessary to invert the hive to receive the bees, (which is frequent, from their manner of alighting,) then first secure the drawers down to the floor, by inserting a handkerchief or something above them: now invert the hive and shake or brush the bees into it: then turn it gently right-end up on the table, or other place, observing the rule aforesaid.

REMARKS.

When there are no fruit trees nor shrubbery in the immediate vicinity of the bees, it is found that they will cluster on bushes artificially set down about the hives; say, take hemlock, cedar, or sugar-maple bushes, six, eight, or ten

feet high; sharpen the largest end, with the foliage remaining on the top, and set them down like bean-poles promiscuously round about the hives, two, three, or four rods distant: when the bees swarm, they will usually cluster in a body on some one of them, which may be pulled up, and the bees shaken off for the hive. Some apiarians confine a bunch of the seed-ends of dry mullen stalks near the top of the bush, so as to represent, at a little distance, a cluster of bees: this is said to be unfailing in catching swarms. Others recommend to drive down two stakes, two or three feet apart, and confine a stick of sufficient strength to each stake two or three feet from the ground, forming a cross-bar, so that, when a board twelve feet long is laid, one end resting on the cross-bar, and the other on the ground, the bees will cluster under it, admitting it is at a reasonable distance, and yet so far from the old stock as to be out of hearing of their hum. Any one will know how to turn the board over, and set an empty hive over the bees.

The hiver is made of three rough boards, half an inch thick, seven inches wide, twenty-four inches long, nailed together like a common trough, open at both ends,—a strap of iron riveted on its outside, across the centre of each board, with a shank or socket to insert a rod to handle it with, so that when inverted by means of the rod, and placed over the bees when alighting, it forms a kind of half-hive, which they readily enter. There should be from a dozen to twenty half-inch holes bored through the top board, so as to let the alighting bees enter through the holes. When a small proportion of the bees are found in the hiver, it may be moved a few feet from the limb, which may be shaken with another rod with a hook on its end, which disengages the bees, and in a few moments the whole swarm will be found in the hiver. By the addition of ferules and joints,

the hiver may be raised to any reasonable height. Thus the labor of climbing, the use of ladders, and cutting the limbs of precious fruit trees, is entirely dispensed with. It likewise enables the apiarian, in large establishments, to divide out and keep separate his swarms, which might otherwise alight many in one body.

Bees swarm from nine o'clock in the morning to three o'clock in the afternoon on a fair day, differing in the season according to the climate. In Vermont, they generally swarm from the middle of May to the 15th July. In backward seasons, this period may be somewhat protracted. We have known them to swarm as early as seven in the morning, and as late as six in the afternoon. We have also known them to come forth when it rained so hard as nearly to defeat them by beating down many to the ground, which were probably lost from their colony; and we once had a swarm come forth on the 16th day of August.

Two reasons, and two only, can be assigned for the swarming of bees. The first is want of room, which causes excess of animal heat; and the second, to avoid the conflict of the queens. It may be possible that a swarm may come forth before the hive is full of comb; but from more than fifty years' observation we have never seen an instance of it, when the hive was not full of bees at the first swarming. This is always the cause of their first swarming, unless the stock had lost their queen previous to swarming, in which case the colony assume the condition of a hive that has once swarmed, and may come out before the hive is full of comb or bees.

The old queen goes out with the new colony, and leaves the remaining stock without a head, (or female.) But nature has supplied them with the instinct, and they commonly have the means of repairing the loss, which a new

colony, unaccompanied by a queen, could not obtain. They have the *larva*, or grub, of the common worker, and the power to convert it into a queen. They soon discover their loss, and immediately set themselves to work to fill the vacancy, by constructing several royal cells, into which they remove the young grubs which would have become workers, and, by feeding them on "royal jelly," in a few days they have a queen. The eggs are commonly laid in litters, about three times a week, during the breeding season; and the bees, to be more sure of succeeding in their experiments, divide themselves into squadrons, and undertake to make more than one, by taking them from different litters, and also avoid the confusion of having a number of queens hatch at the same time. This fact accounts for hearing more than one queen at the same time. Two queens cannot exist together long in the same hive. Nature has implanted an implacable hatred betwixt them; and as soon as the notes of the first-hatched queen are heard, they are answered by notes of defiance by the nymph-queen younger, who is yet in her cell, and has not seen the light; and, if not prevented by the workers, her elder sister tears her from her cell, and immolates her to *her* love of undisputed sway. But if the bees should be sufficiently numerous to protect their queen of their own making, for whom, as the work of their own hands, they seem to have a blind attachment, the elder queen collects her followers, sallies forth, and seeks a new habitation. This is the cause of second and third swarmings which take place, and which frequently so weaken the hive as to cause many of the evils to which bees are subjected, for which we think we have discovered the remedy. (See Chapters X. and XII. See Appendix also.)

If the second swarm does not come out before the seventeenth day after first swarming, there is reason to believe

that the queen has disposed of all her competitors, and that there will be no further swarming that season. The first queen is usually heard the eighth day after the first swarming.

We know of no rule by which the exact day of their first swarming can be known with certainty. The apiarian will estimate near the time by the number of bees in and about the hive, as it will become very much crowded.

The day of second swarming, and all after that during the same season, may be most certainly predicted, as follows: Listen near the entrance of the hive in the evening. If a swarm is coming forth the next day, or in a short time, the queen will be heard piping an alarm at short intervals. The same alarm may be heard until swarming takes place, or one queen is destroyed by the other. The observer will generally hear two queens at a time in the same hive, before the swarm comes out, the one much louder than the other. The one making the least noise is yet in her cell, and in her minority. As queens frequently hatch within a few hours of each other, several of them may escape from their cells, in the short space of one night: then the observer will hear more than two queens, all differing in their tones, sounding on their respective pitches. The sound emitted by the queens is peculiar, differing materially from that of any other bee. It consists of a number of monotonous notes in rapid succession, similar to those emitted by the mud-wasp when working her mortar, and joining it to her cells, to raise mud-wasps. If, after all, the weather is unfavorable to their swarming several days while in this peculiar stage, they will not be likely to swarm again the same season, because the queens, in their conflicts with each other, soon decide the business for the whole season. We have seen but one variation: one year no piping of the queens was heard, yet the second and third swarming was abundant.

Bees are very tenacious to preserve the lives of their sovereigns, particularly those of their own raising ; and when they find they have more than one in the hive, they will guard each so strongly as to prevent, if possible, their coming within reach of each other. Their being thus strongly guarded to prevent the fight, is unquestionably the cause of their giving the alarm, as described a page or two back. The knowledge of the existence of another queen in the same hive inspires them with the greatest uneasiness and rage ; and when the oldest one finds herself defeated in gaining access to her competitor, she sallies forth with as many as see fit to follow her, and seeks a new habitation.

In order to facilitate and hasten the departure of the first swarm in a season, the ventilator should be kept closed, unless the weather is extremely hot, until the hive is well replenished with bees again, after the swarming season closes. [See Fig. 4, Appendix.] By opening the ventilator and suspending the bottom board any considerable distance below the hive, its whole interior soon becomes cooled so far below swarming temperature, that the organization of the new colony is retarded, and may come forth too late in the season to take the best advantage of the honey season, which is usually short in northern climates ; and bees that are well stocked with numbers, generally swarm earliest, and when honey can be collected in the greatest abundance. If the ventilator is kept open during the moth season, the bees are compelled to keep an extra guard to protect the hive from the entrance of millers ; and, as the opening or closing it has no effect in swarming, after the first swarm has left the hive, we recommend keeping it closed through the summer season, except in extreme hot weather, and for other purposes, which will be explained in the proper chapter.

Before the bees sally forth, they fill their sacks with honey, and some of them carry bread on their legs, which supplies their wants, till they have found a new residence, and laid the foundation of their cells. In a very crowded state of the hive, many bees are sometimes compelled to lie out before the queen leaves, and, in the confusion of swarming, not being apprised of her intention to depart, leave without filling their sacks, and this is one cause of the irritability they manifest. This difficulty is obviated in the Vermont hive. [See Appendix.] The drawers furnish them room for their labors till the queen and all her followers have finished their arrangements, and are not compelled to leave empty-handed.

Another reason why bees are sometimes irritable, and are disposed to sting when they swarm, is, the air is forbidding to them, by being cold, windy, damp, extremely hot, or otherwise, so as to impede them in their determined emigration. In all such cases, the apiarian should be furnished with a veil made of millinet, or some light covering, which may be thrown over his hat, and let down so low as to cover his face and bosom, and fixed in such a manner as to prevent their stinging. He should also put on a pair of thick woollen gloves or stockings over his hands, thus managing them without the least danger. Woollen gloves allow the bee to withdraw his sting. Leather retains the sting and kills the bee.

Experience and observation have taught that the queen leaves the old stock first, and her colony rapidly follow. They fly about a few minutes, apparently in the greatest confusion, until the swarm is principally out of the hive. They then alight, generally on the limb of some tree, shrub, or bush, or some other place convenient for them to cluster in a bunch not far from the old stock, and make their arrangements for a journey to a new habitation. Perhaps not one swarm in a thousand know where they are going, until

after they have left the old stock, alighted, and formed into a compact body or cluster; and not then, until they have sent off an embassy to search out a place for their future residence. Now, if the bees are hived immediately after they have alighted, before they send off their embassy to seek a new tenement, they will never fly away, admitting they have sufficient room—for it is want of room that makes them swarm in the first place—and their hive is agreeable, and clear of every thing that is offensive to them.

It is proper, then, that bees should be hived immediately after they have clustered in a body. If this is not done before they have had time to send off an embassy to select a proper habitation, they should be immediately moved to the apiary, or to some place several rods from the spot where they alighted, in order that they may not be found by their messengers at their return. That bees do send forth messengers to seek out a new residence, after they have swarmed and clustered in a body, is evident from the fact that many swarms have been known to enter and take up their abode where a few bees were seen a short time previous. They likewise have been known, in frequent instances, to remain over night, and even several days and nights, before they left for the woods; and, furthermore, when the bees go direct from the old stock, the bee-hunter takes their course by setting his compass, and fixing the old stock as his starting-point; for bees always take a direct and straight course towards their new residence, when they first start. Now, if the hunter takes the old stock as his starting-point, in connection with the place where the bees clustered in a body, he will run as far from his bees as east is from any other point of the compass.

Although bees have several thousand eyes, yet they are fixed in their places in their head, like so many suns; and as

they do not turn in their sockets, like the eyes of men and quadrupeds, they are unable to traverse a crooked path without extreme difficulty ; and when their sight is entirely obstructed for any length of time, they are compelled to alight.

When bees leave for a new residence that is unknown to their owner, several miles distant—and it is believed that bees even see the tree that they have selected for their residence, among many others—and the wind blows not so strong as to vary them from their course, if their observation is not impeded, they will go direct to it ; but if a hill intervenes, so as to entirely obstruct their sight, they may be usually found clustered in a body, not far from the direct line, before they descend the hill on its opposite side. It is believed that the wind, in such cases, usually sags them out of their course ; and although it may be but a few steps, yet the bees get so confused that they are compelled to reorganize before they can proceed on their journey.

Experience has taught that it is best to remove the new swarm, immediately after hiving, to the place where it is intended to stand during the season. We never lost a swarm by flight when this was done. They are creatures of habit, and very soon become associated with the objects and places about them ; and if their hive and companions are not found in the usual place, they have no means of finding them. More or less bees are lost by every removal ; and the longer they remain in the place where they are hived, the more will be lost when removed.

No confusion or noise which is uncommon to the bees should ever be made during their swarming or hiving. The only effect of noise, ringing of bells, &c., that we could ever discover, was, to render them the more hostile and unmanageable. It is indeed true, that swarms of bees have some-

times been stopped and compelled to alight, when they were on the wing for the woods, by blowing horns, shooting guns, throwing dirt, water, &c., amongst them, so as to break up their regular organization, which rendered them unable to proceed on their journey until they could reorganize. In swarming, it is believed a regular organization is not often entirely perfected until after the swarm has left the parent hive, and clustered in a body, in their usual way; for, in swarming, the greatest tumult and confusion ensue through their whole ranks, and they manifest a strong desire to alight so far from the parent hive as not to be interrupted by their *hum*, so as to annoy them in their perfect organization, and arrangements for a new home. Old bees and young ones, middle-aged and all that are capable of taking to the wing, usually sally forth, and leave with the new swarm; except a portion of such bees as are employed in nursing the young larvæ, brooding over the chrysalis, and all that are in the fields at work. Here is perfect wisdom and order, as it would seem, founded in disorder and confusion. The great "Author of all things" has "most wisely" fixed their nature and habits in such a manner as to prevent their overthrow; inasmuch as a great number of their companions are in the fields collecting honey at the time when swarming takes place, which would otherwise, in consequence of the confusion engendered in the hive at that time, join in with the swarm which has departed, and leave the parent stock destitute of a sufficient number of bees to protect their comb from the depredations of the moths, or nurse and bring forward their young queens, and other larvæ and chrysalides, to replenish their reduced colony.

A clean hive is all that is needed for a swarm of bees, with careful and humane treatment.

A cluster of bees should never be shaken, or jarred, any

more than merely to disengage them from the limb or place where they are collected; nor should they fall any great distance, because their sacs are full when they swarm, which renders them both clumsy and harmless, and harsh treatment makes them irritable and unmanageable.

When bees go from the old stock direct to the woods, without alighting, it is when they lie out of the hive before swarming. It is believed that they, being clustered in a body on the outside of the hive, assume the organization of a regular swarm, and their embassy is sent forth to search out a new residence before the swarm leaves the old stock: these cases are very rare. This difficulty is obviated in the Chamber Hive. Instead of lying out before swarming, in idleness, as in the old box, they go up into the drawers, and are there constantly employed in depositing the fruits of their labors, and are less liable to organize in a body before swarming. It is indeed true, that bees have been known to leave and go directly to the woods, when they did not lie out before swarming. But, in all such cases with which I am conversant, an attempt at swarming had been made previously, and the bees had returned to the old stock. The best and most sure method known to stop fugitive swarms, is to confine a large silk handkerchief to the end of a long fish-pole, like military colors, and wave it among the front part of the swarm when on the wing.

Bees become associated with the human family, and will not often flee to the woods, unless they are neglected by their owner, or driven away by bad management. One of the principal causes of fugitive swarms is, want of vital air in the hive. The heat of the sun exhausts the air in the hive of its vitality in a few minutes, in a very hot day, and the bees are compelled to leave it. In 1838, many swarms were known to leave green trees, where they were not well

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shaded by their own branches and those of other trees. Special care should be exercised by the apiarian, that the rays of the sun are excluded from the hive. Animal heat in the hive is absolutely necessary to enable the bees to make comb; but *pent* heat is fatal both to the lives of the bees and their work. An umbrella should be held over the hive during hiving the bees in a hot day, unless it can be otherwise shaded.

No inconvenience will result from letting the bees into the drawers, in first hiving them, if the colony is so large that a majority of them cannot occupy one of them.

Bees commence making their comb where the largest proportion of the colony have sufficient room to work. Now, if a majority of the bees can get into one of the drawers, they will begin to make comb there, for they always commence at the top and work down; of course they will raise young bees, and deposit bread in the drawer. If the swarm is so large as to be unable to work in the drawer, there is no danger of letting them in; and yet, if the swarm is very large, there may be danger, if the bees are prevented from entering the drawer, because they sometimes go off for want of room in the lower apartment. We therefore recommend letting the bees into the drawers at the time of hiving them, in all cases, except when the swarms are small—say under seven pounds—then the rule should be strictly adhered to. And here it should be remarked that the manager of bees is very liable to make a mistake in estimating the size of his swarm, unless they are weighed; for they will occupy at least one quarter more space in a very hot day than when the weather is cool. Notwithstanding we have hived hundreds of swarms, yet we never lost a single swarm, by flight to the woods, that we hived ourselves; yet we hear of some losses of this kind, which renders these remarks neces-

sary. Our practice in hiving is, to get the bees into the shade, hive them as soon as possible, hang on the bottom board, fasten the same forward by means of the button, so as to prevent the escape of any of the bees except through the mouth of the hive, and place the same immediately where we intend it to stand through the season. For ventilation, see Fig. 4. Let the bottom board down three-eighths of an inch on the third day after swarming, and turn the drawers four days after hiving, unless they were turned at hiving.

Occurrences have been heard of where there would seem to have been variations from the foregoing rules concerning swarming: to wit, bees have been known to swarm before the hive is full of bees or comb, and then swarm again two or three days after. Now there is reason to believe that the old stock lost their queen before swarming, and the bees assumed the condition of a hive that had once swarmed, and sent forth another to avoid the conflict of the queens. Very large colonies have been known to swarm out several bushels of bees under such circumstances. Variations from the common rules of making queens more frequently occur as follows, to wit: when the old queen goes out with a swarm, she leaves without providing more than one class of grubs (*larvæ*) which are capable of being converted into queens; and, as the bees always make a plurality of them, they will all be of an age; and in the confusion of swarming, all that are hatched will sally out, and the hive be left destitute of the means of repairing their loss. This also accounts for seeing more than one queen in some small swarms; or there may be more than one class of grubs in the hive after first swarming, and the bees make some queens from each class. Then more than one queen may be seen with a swarm; for all the queens leave that are

hatched. The swarming season usually closes in about seventeen days after its commencement, and the bees seem to possess a peculiar instinct in their nature, which teaches them that the season is too far advanced at this time for them to form new colonies with safety; and they will not permit any of their queens to depart. We have observed, in repeated instances, very compact bunches of bees on the bottom board, some larger than a hen's egg, about the hour of swarming. On examining them, by separating off the bees in our hands, we always found the queen in the centre, unhurt, yet nearly smothered. The bees will commit no violence upon her person, other than pile on and cluster around her in such a manner as to exclude from her all the vital air, and she dies of suffocation. When several queens are found smothered and dragged out of the hives, the apiarian may conclude the swarming-time has closed for the year in the Northern, and for the season, in the Southern and Middle States.

NOTE.—Bees often swarm in the Southern and Middle States early in the spring and late in the summer; but in the North there is but one swarming season in a year.

CHAPTER III.

ON VENTILATING THE HIVE.

GRADUATE the bottom board and ventilator at pleasure by means of the button, or otherwise, so as to give them more or less air, as circumstances may require.

REMARKS.

Bees require more air, in order to enable them to endure the heat of summer and the severity of winter, than at any other time. If they are kept out in the cold, they need as much air in the winter as in the heat of summer. It is in a mild temperature only that it is safe to keep them from the pure air. If placed below frost, in a dry sand-bank, they seem to need scarcely more than is contained in their hive at the time they are buried, during the whole winter. If kept in a clean, dry cellar, the mouth so constructed as to keep out mice gives them enough. But if they are kept in the apiary, there should be a slow, imperceptible current of air constantly passing in at the bottom and off at the top through the ventilator, to let the excess of animal heat escape in the hottest weather in summer, and also to throw off the vapor caused by the breath and other exhalations of the bees, which causes frost and ice in the hive in winter, and which is frequently the cause of the death of the bees.

A proper ventilation at all times during the season for raising young bees is highly necessary. Several evils are to be guarded against. Too much air in April, May, and even

in June, when the weather is cold and chilly, may find its way into the lower part of the hive and destroy the chrysalides, and swarming be greatly retarded, if not entirely prevented. If larvæ are destroyed by a chill, or otherwise, the bees discover their fate, and clear the hive of the nuisance immediately. But not so with the chrysalides. They are confined in their cells by being sealed up, and are supposed by the bees to be in a state of repose, perfectly secluded from the observation of any of them, all waiting for their final transformation to the perfect fly; and their true condition is unknown to any of the bees until, in many instances, a great proportion of the breeding-cells are found filled up with dead putrefied carcasses, already changed to corruption, which renders every attempt to clean the hive on the part of the bees perfectly fruitless; and is frequently the cause of so much derangement in their whole community, that the queen is compelled to enter the chamber for a more comfortable retreat to increase her stock, or the bees are driven to desperation, and gradually pine away and perish by the moths. But, on the other hand, the air does not enter through the apertures into the drawers in sufficient quantities in very *hot* weather to facilitate the labors of the bees with the ventilator and bottom board both closed; hence the apiarian should close the ventilators to all his hives in the spring, before the moths begin to fly, and keep his bottom boards closed up during very chilly turns of weather until the breeding season is over, which usually lasts, in Vermont, from March to October. Every bee-master should clean his bottom boards and lower edges of the hive, so that no web can be formed there, as often as once or twice a week, until the hive is so replenished with bees as to be able to guard themselves from the attack of their enemies.

CHAPTER IV.

ON PREVENTING ROBBERIES.

At the moment it is observed that robbers are within or about the hive, raise the bottom board so near the edge of the hive as to prevent the ingress or egress of the bees, and stop the mouth or common entrance and ventilator. At the same time, take care that a small space on all sides of the hive be left open, so as to afford them all the air they need. Open the mouth only at evening to let out the robbers, and close all but one or two holes early in the morning, before they renew their attack. [See Appendix.]

REMARKS.

Bees have a peculiar propensity to rob each other, and every precaution necessary to prevent it should be exercised by the cultivator. Families in the same apiary are more likely to engage in this unlawful enterprise than any others, probably because they are located so near each other, and are more likely to learn their comparative strength. We never could discover any intimacy between colonies of the same apiary, except when they stood on the same bench; and then all the social intercourse seems to subsist between the nearest neighbors only.

Bees are not likely to engage in warfare and rob each other, except in the spring and fall, and at other seasons when food is not easily obtained from blossoms.

Bees do not often engage in robbery in hives that are well

stocked with bees, unless it is in such as have had their comb broken by frost or otherwise, so as to cause the honey to drip down upon the bottom board. Much care should be exercised by the apiarian to see that all such hives are properly ventilated, and at the same time closed in such a manner as to prevent the entrance of robbers in the daytime, until they have mended the breach, so as to stop the honey from running.

Clear water should be given them every day, so long as they are kept in confinement.

We have known many good stocks to be lost by being robbed, and all for want of care. Bees rob each other when they can find but little else to do; they will rob at any time when frost has destroyed the flowers, or the weather is so cold as to prevent their collecting honey from them. Cold, chilly weather, without frost, prevents flowers from yielding honey, and extreme dry weather dries up the blossoms.

Bees need but little air at any time when they rob; and yet more is necessary for them when confined by compulsory means than otherwise. When deprived of their liberty, they soon become restless, and use their best efforts to make their way out of the hive.

The apiarian will find it for his interest to make the entrance to all his hives by boring holes $\frac{5}{16}$ of an inch in diameter, and not larger, which will enable the bees to guard themselves from robbers when the bottom board closes up the hive. This should be done in all cases where the number of their companions is reduced by swarming, or otherwise, during the robbing season. In this way the bee-manager will be able to enlarge or contract the entrance at pleasure, corresponding with the number of bees going out and coming in from work; giving them all the air they require at this time, and affording them the facilities of stationing but a

small guard for their protection. In large establishments it is frequently necessary to use the canal bottom board, and for a while close the hive entirely. [See Fig. 4, in back part of Appendix.] Some good bee-managers sprinkle robbers with cold water, which usually allays their propensity to pilfer the earnings of their neighbors by frightening them into order, and harmony is soon restored. Perhaps no animal, or insect, or even man in his most barbarous state, possesses a more inordinate desire for *booty* than the honey-bee: honey, or saccharine matter, is all he courts, and to carry his desires into effect, appears to be chiefly regardless of danger. Bees do not, like men or brute animals, seem to possess a spirit of domineering over their fellows; but fight merely to pilfer on the one hand, and defend where they have acquired rights of property on the other; and in this they do not esteem any thing as their own till they are in actual possession; as, for instance, honey is not their own when in the blossoms of trees and plants, or even in the feeder; and the bees of different hives will not often quarrel about it until they have drawn it into their honey-sacs and stored it in the hive.

Bees are frequently known to leave their hives in the spring, and join with other hives, for want of honey, and their owner is deceived with regard to the cause. It is not sure that bees get honey when bread is seen on their legs. Every bee-master should be aware of this; for it is believed that more swarms are lost in April, May, and even in June, in northern climates, for want of honey than by being robbed. A drawer of honey, or one part filled, inserted into the chamber of the hive, will remedy the evil.

CHAPTER V.

ON EQUALIZING COLONIES.

HIVE one swarm in the lower apartment of the hive; collect another swarm in a drawer, and insert the same in the chamber of the hive containing the first. Then, if the swarms are small, collect another small swarm in another drawer, and insert the same in the chamber of the hive containing the first, by the side of the second. In case all the bees from either of the drawers mingle and go below with the first swarm, and leave the drawer empty, then it may be removed, and another small swarm added in the same manner.

REMARKS.

It is of prime importance to every bee-cultivator, that all his colonies be made as nearly equal in numbers and strength as possible. Every experienced bee-master must be aware that small swarms are of but little profit to their owner. Generally, in a few days after they are hived, they are gone. No one can trace their steps: some suppose they have fled to the woods; others, that they were robbed; but, after all, no one is able to give any satisfactory account of them. Some pieces of comb only are left, and perhaps myriads of worms and millers finish off the whole. Then the moth is supposed to be their destroyer; but the true history of the case is generally this: all swarms after the first, the same season, are accompanied by a young queen, which is unable

to deposit eggs for young bees, on account of her youth, for several days, and sometimes weeks, after they are hived in a new tenement; at the same time, every night shows their number less, by various misfortunes and accidents in their journeys to the fields after food, and the bees become discouraged or disheartened, for want of numbers to constitute their colony, abandon their tenement, and join with their nearest neighbors, leaving their comb to the merciless depredations of the moth. These occurrences usually take place before any eggs or young broods are found in the comb. They are sometimes robbed by the adjoining hives, and then the moths finish or destroy what is left.

When bees are collected in drawers for the purpose of equalizing colonies, by doubling, &c., unless they come out the same day, they should be permitted to stand until evening before they are united, it being a more favorable time for them to become acquainted with each other by degrees; and the scent of the bees in the lower apartment will enter through the apertures during the night so much, that there is a greater degree of sameness in the peculiar smell of the two colonies, which reduces their animosity, if they chance to have any.

Second swarms are generally about half as large as the first, and third swarms half as large as second ones.

Now if second swarms are doubled, so as to make them equal in number with the first, the owner avails himself of the advantage of a strong colony, which will not be likely to become disheartened for want of numbers, nor overcome by robbers from stronger colonies.

It is far less trouble, and less expense, for the bee-owner to equalize his colonies, than to prepare hives and drawers of different sizes to fit his swarms.

When colonies and hives are made as near alike as possi-

ble, many evils are avoided, and many advantages realized: every hive will fit a place in the apiary, every drawer a hive, and every bottom board and slide may in any case be used without mistakes.

Swarms may be doubled at any time before they become so located as to resume their former hostility, which will not be discovered before they have deposited some stores and have property to protect. Bees are provided with a reservoir, or sac, to carry their provision in: and, when they swarm, they go loaded with provision suited to their emergency, which takes off all their hostility towards each other; and, until these sacs are emptied, they are not easily vexed, and, as they are compelled to build combs before they can empty them, their contents in some of them are retained several days. We have doubled, at a fortnight's interval in swarming, with entire success. The operation should be performed within two or three days—at the farthest, four days. The sooner it is done, the less hazardous is the experiment. Swarms of bees may be doubled at any time by fumigating both colonies with tobacco-smoke, so as to sicken them a little: the peculiar scent of each is rendered similar by the effect of the smoke, and the two swarms mingle together without manifesting any hostility towards each other.

As a general rule, second swarms only should be doubled. Third and fourth swarms should always have their queens taken from them, and the bees returned to the parent stock, according to Chapter X. (See Appendix on preventing excessive swarming.)

CHAPTER VI.

ON REMOVING HONEY.

INSERT a slide under the drawer so far as to cut off all communication between the lower apartment and the drawer. Insert another slide between the first slide and the drawer. Now draw out the box containing the honey, with the slide that is next to it. Set the drawer on its window end, a little distance from the apiary, and remove the slide. Now supply the place of the drawer, thus removed, with an empty one, and draw the first-inserted slide.

REMARKS.

Care must be exercised in performing this operation. The apertures through the floor in the chamber must be kept closed by the slides during the process, so as to keep the bees from rushing up into the chamber when the box is drawn out. The operator must likewise see that the entrances into the drawer are kept covered with the slide, in such a manner as to prevent the escape of any of the bees, unless he is willing to be stung by them. If the bees are permitted to enter the chamber in very warm weather, they will be likely to hold the occupancy of it, and build comb there, which will change the hive into one no better than an old-fashioned box. This evil may be remedied, however, by placing slides over the apertures, and leaving the door open until the bees retire : then the drawers may be entered.

We have succeeded best in expelling the bees from the drawer by the following method, to wit : Shut the window-

blinds so as to darken one of the rooms in the dwelling-house ; raise up one casement of a window ; then carry the drawer and place the same on a table, or stand, by the window, on its light or glass end, with the apertures towards the light. Now remove the slide, and step immediately back into the dark part of the room, or carry them into the cellar and let them fly out through the window. The bees will soon learn their true condition, and will gradually leave the drawer and return home to the parent stock, thus leaving the drawer and its contents for their owner ; not, however, until they have sucked every drop of running honey, if there should chance to be any, which is not often the case, if their work is finished. In case honey is to be removed at a time when the bees will be likely to carry it back to the parent hive again, set the drawer on the ground. Now place an empty barrel, with one head out, over it, with a hole in the head that is as large as a bung. This darkens the interior of the barrel, so that the bees are unable to return to the drawer. -

There are two cases in which the bees manifest some reluctance in leaving the drawer. The first is, when the comb is in an unfinished state, some of the cells not ceiled over. The bees manifest a great desire to remain there, probably to make their stores more secure from robbers, by affixing caps to the uncovered cells, to prevent the effluvia of running honey, which is always the greatest temptation to robbers.

Bees manifest the greatest reluctance in leaving the drawer when young broods are removed in it, which does not often occur, except in such drawers as have been used for feeding in the winter or early in the spring. When the queen has deposited eggs in all the empty cells below, she sometimes enters the drawers ; and if any empty cells are found, she deposits eggs also. In either case it is better to return

the drawer, which will be made perfect by them in a few days.

Bees never make honey, but extract it from such flowers and other substances as yield it, without producing any change from its original state. Good honey is taken principally from white clover, orchards, sugar-maple, bass and other forest trees, while in blossom. Poor honey is extracted from buckwheat and lowland flowers; hence those who would save their good honey unadulterated by that which is poor, will remove it before the latter can be extracted.

Special care is necessary in storing drawers of honey, when removed from the care and protection of the bees, in order to preserve the honey from insects, which are great lovers of it, particularly the ant. A chest, made perfectly tight, is a good store-house.

If the honey in the drawers is to be preserved for use or market, it should be removed from the vapor of the bees, which stains and colors the honey, swells the timber, cracks the comb, and causes it to drip when warm weather commences. A strip of cloth should be pasted over the apertures, to prevent the entrance of dust, insects, &c. Now it may be packed away in any secure place.

Drawers of honey thus taken care of will improve by age, for several years. Frost cracks the comb, and the honey will drip as soon as warm weather commences. Drawers should be packed with their apertures up, for keeping or carrying to market. All apiarians who would make the most profit from their bees should remove the honey as soon as the drawers are filled, and supply their places with empty ones. The bees will commence their labors in an empty box that has been filled sooner than any others. It is proper here to remark that the bee-manager will find it for his interest to attach a small piece of empty honey-comb

to the under side of the top piece of all his new drawers, so as to facilitate the labors of the bees in commencing work in the box; which is done by melting some beeswax, and attaching the comb to it, when dripped on to the board while hot. In this way, bees may be directed how to build their comb to suit their owner; for they will usually follow their master's orders, if they are in accordance with their instincts; and the bee-master affixes the bit or bits of comb in the box as he wishes them to build. It is found that rubbing hard the inside of new hives or boxes with cold beeswax is the best preparation for a young swarm, or to assist the bees in beginning their work in a drawer; the under side of the top boards where the bees first begin their labors requires particular attention. They may be compelled to write the names of men and things, or draw the likeness of birds, quadrupeds, &c., if their master will lay out their work for them, by mutilating their combs a little so as to form the letters or features desired. Bees will make honey in glass tumblers, bottles, cylinders, bells, globes, &c. But the author of this work cannot recommend either of the foregoing vessels as a substitute for drawers, further than curiosity has its claims. It is found by various and often-repeated trials, that bees will make more comb, and store more honey, in a given time, in a drawer square in its form than in any other, unless the same is made largest at the top, tapering as it descends towards the bottom. Drawers in old stocks should be turned so as to let the bees into them as early in the spring as blossoms are seen.

CHAPTER VII.

THE METHOD OF COMPELLING SWARMS TO MAKE AND KEEP EXTRA QUEENS FOR THEIR APIARIAN OR OWNER.

TAKE a drawer containing bees and brood-comb, and place the same in the chamber of an empty hive; take care to stop the entrance of the hive, and give them clean water daily, three or four days: then unstop the mouth of the hive and give them liberty. The operator must observe Chapter VI. in using the slides, in removing the box from the original hive.

REMARKS.

The prosperity of every colony depends entirely on the condition of the queen, when the season is favorable to them.

Every bee-master should understand their nature in this respect, so as to enable him to be in readiness to supply them with another queen when they chance to become destitute.

The discovery of the fact that bees have power to change the nature of the grub (*larva*) of a worker to that of a queen, is attributed to Bonner. But neither Bonner nor the indefatigable Huber, nor any other writer, to my knowledge, has gone so far in the illustration of this discovery as to render it practicable and easy for common people to avail themselves of its benefits.

The Chamber Hive is the only one, to my knowledge, in which bees can be compelled to make and keep extra queens for the use of their owner, without extreme difficulty, as well as danger, by stings, in attempting the experiment.

The idea of raising her royal highness, and elevating and establishing her upon the throne of a colony, may by some be deemed altogether visionary and futile ; but we will assure the reader that it is easier done than can be described. We have both raised them and supplied destitute swarms repeatedly.

When the drawer containing bees and brood-comb is removed, the bees soon find themselves destitute of a female, and immediately set themselves to work in constructing one or more royal cells. When completed, which is commonly within forty-eight hours, they remove a grub (*larva*) from the worker's cell, place the same in the new-made queen's cell, "feed it on that kind of food which is designed only for queens," and in from eight to sixteen days they have a perfect queen.

As soon as the bees have safely deposited the grub in the new-made royal cell, the bees may have their liberty. Their attachment to their young brood, and their fidelity to their queen, in any stage of its minority, is such, that they will never leave nor forsake them, and will continue all their ordinary labors with as much regularity as if they had a perfect queen.

In making queens in small boxes or drawers, the owner will not be troubled by their swarming the same season they are made. There are so few bees in the drawer, they are unable to guard the nymph queens, if there are any, from being destroyed by the oldest, or the one which escapes from her cell first.

In examining the drawer in which I raised an extra queen, I found not only the queen, but two royal cells, one of which was perfect in shape ; the other was mutilated, probably by the queen which hatched out first. Now when there are few bees to guard the nymphs, it would not be very

difficult for the oldest queen to gain access to the cells, and destroy all the minor queens in the drawer.

When a drawer is removed to an empty hive, for the purpose of obtaining an extra queen, but one hole to the entrance of the hive should be left open. It should be placed some distance from the apiary, the better to prevent its being robbed by other swarms. When it is some distance from other colonies, they are not so likely to learn its comparative strength. There is but little danger, however, of its being robbed, until after the bees are out of danger of losing their queen, which generally occurs in the swarming season, or soon after.

The queen is sometimes lost, when she goes forth with a swarm, in consequence of being heavily laden with eggs, and too feeble to fly with her young colony; in which case the bees return to their parent stock in a few minutes. In fact, all occurrences of this kind originate in the inability of the queen. If she returns to the old stock, the swarm usually comes out again the next day, if the weather is favorable. If the queen is too feeble to return, and the apiarian neglects to look her up, and restore her to her colony again, (which he ought to do,) the bees will not swarm again until they have made another, or are supplied, which may be done immediately by giving them any spare queen.

The queen is sometimes lost, in consequence of the young brood being too far advanced at the time of the departure of the old queen with her swarm. She may become barren or diseased, and die of old age, and all the grubs (*larvæ*) may have advanced so far towards the perfect fly at the time of her death, that their nature could not be changed to a queen before the bees had become apprised of her true condition; or she may be lost at second swarming, as explained in Chapter II; or she may be lost by accident when she goes

out of the hive into the air for exercise, or for the purpose of forming the sexual union with the drone; because, on returning to the hive, she has been known to enter her neighbor's hive by mistake, and lose her life before she could make her escape.

NOTE.—We think all close observers of bees will accord with this doctrine, when they reflect upon the fact that the queen frequently sallies forth for exercise or for other purposes, of which we see repeated indications during the breeding season, to wit: the bees assume the appearance of the commencement of swarming; they fly very thick before the hive, and run in every direction on its outside. In short, it would seem that hostilities had commenced in great earnest betwixt that and some unknown hive, or that they were in a real sport. Now the bees miss their sovereign when these peculiar feats are seen, and on her return, all is quiet.

CHAPTER VIII.

ON SUPPLYING SWARMS DESTITUTE OF A QUEEN WITH ANOTHER.

TAKE the drawer from the hive, which was placed there according to Chapter VII., and insert the same into the chamber of the hive to be supplied, observing Chapter VI. in the use of the slides; or remove a box containing brood-comb as above described, and the bees will make one for themselves; or take a queen from any small swarm, and introduce her at the mouth of the hive.

REMARKS.

Colonies destitute of a queen may be supplied with another the moment it is found they have none; which is known only by their actions.

Bees, when deprived of their female sovereign, cease their labors; no pollen or bee-bread is seen on their legs; no ambition seems to actuate their movements; no dead bees are drawn out; no deformed bees, in the various stages of their minority, are extracted, and dragged out of their cells, and dropped down about the hive, as is usual among all healthy and prosperous colonies.

Swarms that have lost their queen, when standing on the bench by the side of others, will run or fly into the adjoining hive without the least resistance. They will commence their emigration by running, in confused platoons of hundreds,

from their habitation to the next adjoining hive. They immediately wheel about and run home again, and thus continue, sometimes for several days, in the greatest confusion, constantly replenishing their neighbor's hive, by enlarging their numbers, and at the same time reducing their own, until there is not a single occupant left; and, remarkable as it is, they leave every particle of their stores for their owner, or the depredations of the moth. In these cases no young brood are ever found in the combs they have left.

Colonies lose their queens more frequently during the swarming season than any other.

In the summer of 1830, we lost three good stocks of bees in consequence of their losing their queens, one of which was lost soon after the first swarming, the two others not many days after the second swarming,—all of which manifested similar actions, and ended in the same results, which are more particularly explained in Chapters II. and VII.

The queen, when lost in swarming, is easily found, unless the wind is so strong as to have blown her a considerable distance.

A few bees are usually found with her, which probably serve as her aids, and greatly assist the apiarian in spying her out. She is frequently found near the ground, on a spire of grass, the fence, or any place most convenient for her to alight, when her strength fails her. We once had quite a search for her majesty, without much apparent success. At the same time there were flying about us a dozen or more common workers. At last her royal highness was discovered, concealed from our observation in a fold of our shirt-sleeve. We then returned her to her colony, which had already found their way home to their parent stock. When queens are lost in swarming, and the bees return to the

parent hive, catch a young queen from any small swarm, and introduce her at the mouth of the old hive. If their queen is lost, as was anticipated, she will enter and usually bring out the swarm in the course of a day or two; otherwise, the bees must remain in the old stock several days for a queen, which is a great loss of time to them, in their most abundant harvest.

The queen may be taken in the hand without danger, for she never stings by design; her timidity disarms her of every species of hostility; she may be drawn in quarters, and she will not sting. In trying many experiments, we never could discover in her the least hostile feeling, except when conflicting with one of her own species: her only exertion seems to be to make her escape; and yet she has a sting much longer than a worker.

The queen is known by her peculiar shape, size and movements. She is not often found standing still like other bees: she is usually on the constant move, running over, under, through, betwixt and all around the swarm. She differs but little in color from a worker, and has the same number of legs and wings. She is MUCH LARGER and LONGER than any of the bees. HER ABDOMEN IS VERY LARGE AND PERFECTLY ROUND, and is shaped more like the SUGAR-LOAF, which makes her known to the observer the moment she is seen. Her wings and proboscis are short. Her movements are stately and majestic; at the same time shy, and rather inclined to conceal herself from human observation, with seeming jealousy of being caught. We have known her to remain in the air on the wing several minutes after her whole colony had alighted, when we stood near the swarm. She is much less in size after the season for breeding is over. She is easily selected

from among a swarm, at any season of the year, by any one who has often seen her. Cut off the limb and shake the bees on a table to find the queen, or shake the bees into a milk-pan : if the queen is with them, they will remain quiet chiefly in the pan, otherwise they will all take the wing in a few breaths.

CHAPTER IX.

ON MULTIPLYING COLONIES TO ANY DESIRABLE EXTENT, WITHOUT THEIR SWARMING. *

THE large drawer, No. 1, should always be used for this purpose. Insert slides, as in Chapter VI., and remove the drawer containing bees and brood-comb; place the same in the chamber of an empty hive; stop the entrances of both the new and old hives, taking care to give them air, as in Chapter IV. Give clean water daily, three or four days. Now let the bees in both hives have their liberty.

REMARKS.

This operation is both practicable and easy, and is of prime importance to all cultivators who wish to avoid the necessity of hiving them when they swarm; and yet it will not prevent swarming, except in that part of the divided colony which contains the queen at the time of their separation. The other part being compelled to make another queen, (and they generally make two or more,) may swarm to avoid their conflict, as explained in Chapter II. The hive containing the old queen may swarm for want of room; but at any rate, in performing the operation, it has saved the trouble of hiving one swarm, and prevented all danger of their flight to the woods.

Multiplying colonies by this rule is a perfectly safe method of managing bees, when the seasons were favorable, and not otherwise.

CHAPTER X.

ON PREVENTING THE DEPREDATIONS OF THE MOTH.

ALL such stocks as are infested with the moth will manifest it as soon as warm weather commences in the spring, by dropping some of the worms upon the bottom board. Let the apiarian clean off the bottom board as often as it becomes filthy.

Immediately after a second swarm has come forth from a hive, the same season, the old stock should be examined; and if swarming has reduced their numbers so low as to leave unoccupied comb, the apiarian should take the queens from the swarm, and let them return to the old stock.

Third and fourth swarms should always have their queens taken from them, and the bees returned to the parent stock. (See Appendix on preventing swarming.)

REMARKS.

“This insect (the moth) is a native of Europe, but has found its way into this country, and naturalized itself here.”—*Thatcher.*

This unwelcome visitor has interested the attention and called forth all the energies of the most experienced apiarians of our country, and of many of the greatest naturalists in the world, to head his course. Their movements have been observed and scrutinized by the most learned; their nature has been studied; various experiments have been tried to pre-

vent their depredations; but, after all, the monster in "gaudy hue marches onward," committing the greatest havoc and devastation, with but little molestation. We have lost our whole stock at least four times since 1808, as we supposed by the moth. We tried all the experiments recommended in this and other countries, that came to our knowledge; but, after all, we could not prevent their ravages.

In 1830, we constructed a hive (which was patented in 1836) which we supposed would afford all the facilities for managing bees in every manner that their nature would admit of, and at the same time render their cultivation most profitable to their owner. By constructing windows of glass on every side of the hive, nearly the size of its sides, and darkening them by closing doors on the outside of the windows, which may be opened at pleasure, we have been able to discover many important facts, both in relation to the nature and economy of the bee, and its enemy the moth; but probably much yet remains to be learned concerning both.

The moth, when first discovered by the common observer, is a white worm or maggot, with a reddish crusted head, and varies in size according to its living. Those which have full and unmolested access to the contents of a hive will frequently grow as large as a turkey-quill, and an inch and a half in length. Others are scarcely an inch in length when full grown. They have sixteen short legs, and taper each way from the centre of their bodies.

The worms, like the silk-worm, wind themselves into a cocoon, and pass the dormant (chrysalis) state of their existence, and in a few days come out of their silken cases perfect winged insects or millers, and are soon ready to deposit their eggs, from which another crop will be raised.

The miller, or perfect moth, is of a grayish color, from three-fourths of an inch to an inch in length. They usually

lie perfectly still in the daytime, with their heads downward, lurking in and about the apiary. They enter the hive in the *night*, and deposit their eggs in such places as are uncovered—of course unguarded by the bees. The glue with which the bees fill up shakes or cracks in the boards of which the hives are composed forms a very congenial nidus, or nest, for the deposit of the egg, furnishing the grub with appropriate food, and hastening its development; and the timber, in the mean time, securing it from the attack of the bees, until it has had time to enclose itself in a silken armor. This renders it important that the directions given in the first chapter, with regard to the structure of the hive, should be strictly attended to. These eggs hatch in a short time, varying according to circumstances, probably from two or three days to four or five months. At an early stage of their existence, while yet a small worm, they spin a web, and construct a silken shroud, or fortress, in which they envelope themselves, and form a sort of path or gallery, as they pass onward in their march; at the same time, being perfectly secure from the bees in their silken case, which they widen as they grow larger, with an opening in their front only, near their head, they commit the greatest havoc and devastation on the eggs, young bees, and all that come in their way as they pass.

Now, unless the bees chance to catch him by the collar, or nape of his neck, while feeding, and drag him out of his place of concealment, they will be compelled to cut away the combs all around his silken path, or gallery, and drag out the worm and his fortress altogether. At the same time, the bees are compelled to cut away the combs so far as to destroy many of their young broods in making room to remove the annoyance. We have known them to cut away their combs from four to eight or ten inches, to remove this silken shroud, in doing which we have known them to cut and drag

out their only remaining queen before she was transformed to the perfect fly, which occasioned the entire loss of the whole colony.

When the moth has arrived at its full state of maturity, he makes preparation to change to a miller, by winding into a cocoon, as has been already explained. The miller is surprisingly quick in all its movements, exceeding by far the agility of the quickest bee, either in flight or on its legs. Hence the enemy becomes so formidable that the bees are easily overcome, and soon fall a sure prey to him.

Repeated experiments have demonstrated the fact, that placing bees on the ground, or high in the air, is no security against the moths. We have lost some of our best stocks by placing them on the ground, when those on the bench were not injured by them. We have made a groove in the bottom board, much wider than the thickness of the boards to the hive, and filled the same with loam. We then placed the hive on the same, in such a manner as to prevent any crack or vacancy for the worms; and yet, in raising the hive for weeks afterwards, we found them apparently full-grown all around the hive in the dirt. We have found them very plentiful in trees ninety feet from the ground.

The best method, in common practice, to prevent the depredations of the moth, is to suspend the bottom board so far below the lower edge of the hive as to give the bees free entrance and egress all around the same during the moth season, or to raise the common hive, by placing under it little blocks at each corner, which produces good effect. But this plan often fails, and the apiarian who adopts it is compelled to suffer the mortification of losing some of his best stocks, and to feel that success in the management of bees depends much upon chance or accident.

To remedy the evils which the moths produce, to prevent

their ravages, and at the same time enable the cultivator to take advantage of the known instincts of the bees, in order to promote their prosperity, and advance his own interests, we constructed the hive now called the Vermont Hive, differing materially from the old box, in which we commenced a series of observations and experiments, which have been highly satisfactory, and prove that its structure is adapted to the nature of its occupants.

Large hives that never swarm are never destroyed by the moth, unless they lose their queen, melt down, or meet with some casualty, out of the ordinary course of managing them. They are not often in the least annoyed by them, unless there are bad joints, cracks, or shakes, so as to afford some lurking-places for the worms. The reason for their prosperous condition is obvious. The stock of bees is so numerous that their comb is all kept well guarded during the moth season, so that no miller can enter and deposit her eggs.

Hives made so small as to swarm, are liable to reduce their colonies so small as to leave comb unguarded, especially when they swarm three or four times the same season. All swarms, after the first, sally forth to avoid the battle of the queens; constantly making a greater draft, in proportion to the number left, until the comb is partially exposed, which gives the miller free access to their edges. The seeds of rapine and plunder are thus quickly sown, and soon vegetate, and fortify themselves by their silken fortress, before the bees are aware that their frontiers are invaded. While the moths are thus engaged in establishing their posts on the frontiers of the bees, the latter are constantly and indefatigably engaged in providing themselves with another queen, to supply the place of the old one, which has departed with a swarm, and raising young bees to replenish their reduced colony. Now, as the moths have got possession of the

ground on their frontiers, it requires a tremendous effort, on the part of the bees, to save their little colony from a complete overthrow.

If late or second and third swarms are always returned immediately, according to the rule, the comb is kept so guarded that the moths are compelled to keep their distance, or be stung to death before they can accomplish their purposes. By using the Vermont Hive, strictly adhering to the directions given in this Manual, the manager of bees is enabled to control the size of his swarms to a great degree, and keep the numbers of the original stock full, and in this manner render them more than a match for their deadly enemies. But this industrious insect is exposed to other accidents and misfortunes, which may be remedied or prevented by the use of this hive. [See Appendix.]

The moths are often complained of when they are not guilty. Hives are frequently abandoned by their occupants, in consequence of the loss of their queen, unnoticed by any observer; and, before any thing is known of their fate, the hive is destitute of bees, and filled with moths.

Hives made so large as not to swarm may lose their queen, and then they will abandon their habitation, and emigrate into the adjoining hive, leaving all their stores to their owner, which, unless immediately taken care of, the moths will not fail to destroy.

In the summer of 1834, one of our neighbors had a very large hive that never swarmed, which lost its queen; and in the course of a few days the bees entirely vacated their tenement, and emigrated into an adjoining hive, leaving the whole of their stores, which amounted to 215 lbs. of honey in the comb. No young bees or moths were discovered in the hive. Instances of this kind frequently occur, and the true cause is unknown, from inattention.

The queen is much more tenacious of life than any other bee, and may live much longer. It is believed that the common bees do not often live to exceed eight months. The queen is supposed to live several years. By clipping one wing of a queen accompanying a second swarm, she has been known to come out with the first swarms for several successive years. Only one queen can exist in the same hive any great length of time. When there are more than one, the peculiar sound of each, as explained in remarks on Chapter II., is heard by the other, which usually results in a battle between them, or the issue of a swarm in the course of a day or two, unless the swarming season is nearly at a close; then the common bees sometimes smother them, as already explained.

Bees, when placed in a dark room in the upper part of the house, or some out-house, are easily kept (not cultivated) a while, and may be of some benefit to their owner; but as they are liable to most of the casualties that swarming-hives are, they cannot be as profitable. It takes several years before much comfort, other than the amusement of seeing them work, can be realized; besides, if they chance to escape the moth, the comb is rendered exceeding dark-colored and filthy where the bees locate in the winter; and a disagreeable smell, which is caused by their winter breath and other exhalations, is the result. In a few years, many of the bees either become paupers, or acquire habits of indolence, and, as a natural consequence, soon manifest it by their irritability, unlike those colonies which are industrious, and in a healthy and prosperous condition. Besides, it is unusual for large hives of bees to make much extra honey after the third or fourth year.

Large colonies never increase their stock in proportion to the swarming colonies. There is but one female in a large

colony, and they can do but little more, in raising young bees, than to keep their stock good by replenishing them as fast as they die off, or are destroyed by the birds, reptiles and insects, which are great admirers of them, and sometimes swallow them by dozens. Now, if it requires five swarming colonies to be equal in number to the one first described, it is not difficult to imagine that five times as many bees may be raised by the swarming colonies; for one queen will probably lay as many eggs as another.

The swarming-hives are no more liable to be destroyed by the moth, during the swarming season, than others, if the hives are kept well replenished with bees.

CHAPTER XI.

ON FEEDING BEES

IF it is found that a swarm need feeding, hitch on the feeder, well stored with good honey, while the weather is warm in October; or place comb filled with strained honey in the chamber of the hive, or on the bottom board, or both at the same time, without dripping, and the bees will store the honey in the lower apartment of the hive, if done while the weather is warm.

The apiarian should use the same precaution in feeding as directed to prevent robberies.

REMARKS.

The best time to feed is in the fall, before cold weather commences. All hives should be weighed, and the weight marked on the hive before bees are hived in them. Then, by weighing a stock as soon as frost has killed the blossoms in the fall, the apiarian will be able to form a just estimate of their necessities. When bees are fed in the fall, they will carry up and deposit their food in such a manner as will be convenient for them in the winter.

If feeding is neglected until cold weather, the bees must be removed to a warm room, or dry cellar, and then they will carry up their food generally no faster than they consume it. Even then the honey must be warmed a little, otherwise the bees are unable to swallow it.

A feeder should be made like a box with five sides closed,

leaving a part of the sixth side open, to admit the bees from their common entrance. Its floor should be level, when hitched on the front of the hive. It should be of sufficient depth to lay in comb, filled with honey. If strained honey without comb is used for feeding, a float, perforated with many holes, should be laid over the whole of the honey in the box, or feeder, so as to prevent any of the bees from drowning; and at the same time, this float should be so thin as to enable them to reach the honey. It should be made so small, that it will settle down as fast as the honey is removed by the bees. There should be a tube inserted vertically through the float, and made fast to it, extending upward through the top of the box, in such a manner as to receive the honey from a tunnel, and convey the same directly under the float. A light of glass should be placed in the back side, and a door to close and darken it at pleasure.

Great profits may be made in large apiaries by feeding cheap honey, (I mean honey that is made entirely by the bees, and is a production of the West India Islands and other places, where the flowers yield honey of a rank, unpleasant taste,) in the fall. The bees, being compelled to carry up and deposit the cheap honey in the lower apartment of the hive, (and they will live on that as well as any other, if it is pure honey,) their owner can compel them to carry as much pure white clover honey into the drawers the following season, there being no room to store it below. Swarms will feed out and deposit ten pounds of honey a day and night each hive, in warm weather. Small drawers cannot be depended on as feeders, except in the spring and summer, unless they are kept so warm that the vapor of the bees will not freeze in them. It would be extremely hazardous for the bees to enter a frosty drawer. They will sooner

starve than attempt the experiment. Drawers may be used without danger from robbers ; but when the feeder is used, robbers must be guarded against. [See Appendix to prevent robberies.]

Bees should not be fed in the spring, unless they are nearly destitute of honey, because they fill up the brood-comb too much with honey ; when fully fed in the fall, the bees store up the honey in such a manner as will be convenient for them in the winter ; and, notwithstanding the cells for raising young bees are filled up with honey at that time, the bees consume the honey and empty the breeding-cells in the course of the winter, so that the queen is not interrupted in depositing her eggs to raise young bees in the spring following. We would not be understood to say there is no danger of feeding too bountifully in the fall. Rare instances have been known, in which the hive was so perfectly filled with honey at this time, that the bees found no resting-cells, and, when cold weather commenced, the hooks to their feet tired, and the bees dropped and perished.

A good swarm of bees in the Vermont Hive should weigh at least twenty-five pounds the first of December, in addition to the weight of the hive : thirty-five or under forty pounds will not be too much.

Care should be exercised, in fall-feeding, to supply them with good honey, otherwise the colony may be lost before spring by disease. Good honey is the sweet nectar yielded from the blows of timber and plants cultivated, or that grows spontaneous in all countries, or it is the sweet substance contained in any timber, plant, (root or branch,) that can be extracted before a chemical process is brought to act upon it. This most pure and unadulterated substance gradually changes,—naturally, by its combination with oxygen, which sours it,—artificially, by being boiled, crystallized, &c., and becomes sugar, molasses, &c. If honey is very thick, it may

be diluted with water very little, when fed in the spring, to facilitate perspiration. Poor honey may be given them in the spring, at the time when they can obtain and provide themselves with medicine, which they only best understand.

Sugar dissolved, or molasses, may be used in the spring to some advantage, but ought not to be substituted for honey, when it can be obtained. As many experiments in feeding bees have been tried since the publication of our previous editions, it may be proper to continue these remarks some further; and as many persons in the country have endeavored, for a few years past, to make great speculations and *enormous profits*, by feeding bees with cheap honey, the principles of these great profits should be better understood.

Some persons have gone so far as to incorporate a small proportion of the poorest and cheapest kind of West India honey with a larger proportion of water, and a quantity of the poorer quality of sugar, with a little yeast, and after the bees had passed it through their laboratory, it was sold in market, at high prices. We would not depreciate any improvement, merely because it had reached beyond all our researches, especially in these days of "steam and electricity," but the public should be cautioned against all approaching danger. We are inclined to believe that a substance which may, perhaps, be improperly called *honey*, may be made in this way, by incorporating pure Northern honey with loaf sugar, but it will cost so much, in our estimation, that market prices will by no means cover the expense.

Bees may be fed on cheap West India honey to great advantage, as already remarked; but if they are allowed to carry it into the drawers or boxes for sale, we believe it is a fraud upon the purchaser. Its quality is not materially changed by any labor the bees may bestow upon it. If it is dirty, they will cleanse it, and make wax of it sufficient to

hold what remains. Bees, in our view, never made a particle of honey since their creation ; all they can do is to collect it together where it is found by them, and separate it from dirt and foreign substances mixed with the honey, but not incorporated with it; and to do this service, the honey-bee is the most expert and perfect of all animals ; they can even change back to its original pure, fluid state, honey that has become oxydized or candied from age, by their insect heat, without the least exertion on their part, other than to congregate so as to fill up the interstices betwixt the combs, for a few hours. Some plants that are poisonous secrete honey in their blossoms, but the bees have neither the skill nor the power to separate the poison from the pure saccharine matter. Here the poison is incorporated with the honey, and the whole goes into the hive together, and he who swallows the honey swallows the poison along with it.

Saccharine matter that is secreted in the flowers or blossoms of trees or plants is *pure honey*, each of its kind or quality unadulterated, save by its medicinal properties ; each participating in its own peculiar properties, so that when the honey is taken into the human stomach, it will produce a similar effect upon the blood that a decoction of the leaves and blossoms of the plant would, that produced the honey. The honey from motherwort is motherwort still ; the fact that the bees have sucked it into their honey-sacs and then ejected it into the comb in the hive, has not changed the nature of the fluid, except giving it a slight taste of insect heat, which is characteristic of all honey, after it has been collected and deposited by these insects. The taste that is communicated to all saccharine matter that has passed this ordeal is calculated to deceive, and requires considerable practice, on the part of the honey-dealer, to distinguish readily the good from the bad, like adulterated wines and other spi-

rituous liquors. All kinds of saccharine matter are eagerly sought after by the bees, at all seasons of the year when the weather is so warm that they can fly; and all sweets, without regard to poisons, are carried alike to the hive, and deposited by them in the combs for future use. The exudations from hard timber, cracked by frost during the previous winter; the ooze from blotches on the branches of the several classes of oak, and perhaps of other timber, caused by very dry, hot weather, consist of pure, good honey, which, together with the saccharine deposits in poisonous plants in the low, swampy localities, finds its way indiscriminately into the hive.

Now, to make good honey by feeding bees, the best materials should be employed. The honey of hard timber blossoms, or white clover, incorporated with loaf-sugar, will unquestionably make excellent honey; or materials less pure than these will make honey, (if it be proper to style it thus;) but as it is believed to be a well-settled fact that it requires from one and a half to three pounds of wax made into comb sufficient to contain seventy or eighty pounds, and it takes at least twenty pounds of honey to make one pound of comb, it will be seen that nearly one-third of the prepared "feed" is lost while passing through the bees' laboratory and in the preparation for market, besides the amount used by them for food. Now, if we are right in this matter, cheap feed alone can be used to advantage and made cover expenses; and this in large apiaries only, where bees are congregated in large bodies, and are liable to come under the influence of one queen.

As several large apiaries have been recently established in Western Vermont, for the purpose of making honey for market, by feeding bees, it may be proper to remark that, to our knowledge, none of them has hitherto succeeded so far as to satisfy their owners that they have made a good invest-

ment; and our previous opinions concerning large congregations of bees in one body are more and more confirmed, as already expressed in previous remarks on Rule 10, pages 59 and 60.

Moreover, since the bees appear to die off more rapidly in proportion to their number, in these large bodies, and rear their young more slowly than in swarming-hives, it is found necessary to purchase swarms from the bee-owners in the surrounding country, in order to preserve the stock sufficient to work to advantage. The effect of this is to diminish the number of swarms in the country; and at the same time, if these mammoth establishments are not abundantly supplied with "feed" by their owners, and the blossoms of plants fail to yield honey sufficient, their predatory incursions among the single hives in the vicinity will soon empty them of their contents. We have known many hives entirely ruined in ten or fifteen minutes, after an attack by robbers in the vicinity of a large apiary. When a swarm of bees is conquered by the enemy, it is not often that they can be resuscitated and restored to their former activity and independence—at least by any human skill. We have seen the vanquished bees to unite, make treaties of peace with their enemies, and assist in removing the contents of their hive to that of their conquerors; after which they would all go in a body, like a new swarm, take up their abode, and remain peaceable and orderly subjects in the hive, with the honey which had been seized by the robbers. Still, it is more usual for the vanquished to yield up their property to the victors, remain in their own domicile, and perish with hunger.

As we have lived in close contiguity to the apiary, bestowed much time upon its improvement for more than sixty years, and carefully studied the habits and instincts of the bee for more than a quarter of a century, we believe the

foregoing remarks will be applicable in most cases. Still, there may be some exceptions, as in all general rules; but if a new "era" has been "ushered into the world," as is believed by many of our most talented and literary men, concerning the apiary, we hope to live long enough to see and share its blessings.

CHAPTER XII.

ON WINTERING BEES.

TURN over the drawers so as to prevent the entrance of the bees, or their breath, in September or fore part of October. When cold weather commences, suspend the bottom board half an inch, and open the ventilator.

REMARKS.

The watery substance which is caused by the breath and other exhalations of the bees, and collects in the drawers in cold weather, should be kept out of them; because frost forms in them, and runs down through the apertures on to the bees as often as it melts, and makes the bees damp, and the comb mould; besides, this vapor penetrates and fills the timber, (drawers and chamber,) and causes a disagreeable stench in and about the hive the whole of the following season, and is the cause of introducing the little ants into the chamber.

A great improvement on the usual way is found in wintering bees over a box two or three inches deep, made to fit the bottom of the hive, with a space an inch or two wide on one of its sides, covered with wire screen, so as to prevent the escape of any of the bees from the hive when the mouth is stopped, and a bit of wire screen confined over the ventilator, which should always be kept open in the winter: at the same time, the box receives all the filth of the bees during the winter, and is removed in the spring, leaving the apiary

perfectly sweet, and the bottom board is returned to the hive in its proper place.

There are three principal causes of death among bees in the winter, to wit: want of honey, (not bread, for they never eat it except when in the larva state,) want of air, and freezing.

Bees sometimes die of starvation, with plenty of honey in the hive at the same time. In cold weather they crowd together in a small compass in order to keep warm; and then their breath and vapor collect in frost in all parts of the hive, except in the region they occupy. Now, unless the weather moderates, so as to thaw the ice, the bees will be compelled to remain where they are located until their stores are all consumed that are within their reach. One winter we had cold weather ninety-four days in succession, during which time the bees could not move from one part of the hive to another. We examined all our hives on the eighty-third day, and on the ninetieth day, we found four swarms dead. We immediately examined for the cause, which was as already stated. We then carried all our hives into a warm room and thawed them, so that the bees could move.

Too much swarming frequently occasions the loss of the old stock the winter following, because their companions are so reduced in numbers that the necessary animal heat cannot be kept up in the hive to prevent them from perishing by cold. All such stocks should be stored in a dry cellar or some warm room, where they can be kept comfortable during cold weather. It is believed that bees may be kept through the winter without losing them, if the apiarian is attentive to their wants. If destitute of honey, he will feed them; if suffering for want of air, (which is the most frequent cause of death,) he will ventilate them; if freezing,

he will thaw them out;—in short, if they are apparently dead, he will resuscitate and bring them to life and activity, which may be done in all cases, (except when smothered,) if attended to in season. In February, 1838, we had a swarm that was starved by design. We resuscitated them three times, without feeding, in three successive days, before life was extinct. The life of bees many times is in a state of suspension a considerable time before their death, and may be resuscitated by human aid, when otherwise life would become extinct. We have resuscitated them repeatedly under various circumstances for ourselves and neighbors. Some of the best stocks we now own were once apparently dead. A screen bottom board should be used so as to let up the warm air into the hive, and at the same time enable the apiarian to control and keep the bees in the hive during the process of resuscitation. The feeder should be used in every case, to give the bees exercise, and restore activity.

A cellar made in the side of a dry hill, so covered as to keep out water, is a good storage for wintering bees. There should be two ventilators at the two most extreme parts of the cellar—one near the bottom, and on its side, to admit pure air—the other through the top or covering, to let the bad air escape.

It is found, by experiment, that two or more swarms united in the fall, will not consume near as much honey during the winter as when kept in separate hives. When it is found, as it usually is, in large establishments of bees in the fall, that some hives are too feeble or too few to winter profitably, the apiarian will find it for his interest to unite them with stronger swarms, which is very easily done by fumigating them with tobacco-smoke, so as to sicken both swarms a little. Now take the feeble swarm to the place where the strong one stands, invert the hive, and set the one

in which the bees are to winter over it. If the bees manifest any hostility towards each other, it is very easy to remove one or both of the drawers from the hive that is under, and blow smoke into its chamber, which will enter through the apertures among the bees, which will soon bring them to terms of peace, and the bees mingle together in the upper hive. Now the lower hive may be removed, and preserved, with all its contents, for a new swarm the following season, and is worth more for this purpose than it ordinarily can be for any other.

CHAPTER XIII.

ON TRANSFERRING SWARMS.

THIS operation should never be effected by compulsion.

First Method.—Insert drawer No. 1 into the chamber of the hive to be transferred, as early as the first of May. If the bees fill the drawer, they will recede from the lower apartment and winter in the drawer. As early in the spring as the bees carry in bread plentifully on their legs, remove the drawer, which will contain the principal part of the bees, to an empty hive. Now remove the old hive a few feet in front, and place the new one containing the drawer where the old one stood. Now turn the old hive bottom up. If there are any bees left in the old hive, they will soon return and take possession of their new habitation.

Second Method.—Take drawer No. 1, well filled by any hive the same season,—insert the same into the chamber of the hive to be transferred in September: (August would be better.) If the bees need transferring, they will repair to the drawer and make the same their winter-quarters. Then proceed in the spring as directed in the first method.

REMARKS.

This management should excite a deep interest in every cultivator, both in a temporal and moral point of view: temporal, because the lives of all the bees are preserved;—moral, because we are accountable to God for all our acts.

We are not to be justified in taking the lives of animals or insects, which are but lent blessings, unless some benefit to the owner can be derived from their death, which will outweigh the evils resulting from such a sacrifice. Duty compels us to protest, in the strongest terms and feelings, against the inhuman practice of taking the lives of the most industrious and comforting insects to the wants of the human family, by fire and brimstone.

When bees have occupied one tenement for several years, the comb becomes thick and filthy, by being filled up with old bread and cocoons, made by young bees, when transformed from the larva to a perfect fly.

Bees always wind themselves in their cells, in a silken cocoon, or shroud, to pass their torpid and defenceless (chrysalis) state. These cocoons are very thin, and are never removed by the bees. They are always cleaned immediately after the escape of the young bees, and others are raised in the same cells. Thus a number of bees are raised, which leaves an additional cocoon as often as the transformation of one succeeds that of another, which often occurs in the course of the season. Now, in the course of a few years, the cells become so contracted, in consequence of being thus filled up, that the bees come forth but mere dwarfs, and cease to swarm. Comb is rendered useless by being filled up with old bread, which is never used except for feeding young bees. A greater quantity of this bread is stored up yearly than is used by them, and in a few years they have but little room to perform their ordinary labors. Hence the necessity of transferring them, or the inhuman sentence of death must be passed upon them, not by being hung by the neck until they are dead, but by being tortured to death by fire and brimstone.

It is obvious to every cultivator that old stocks should be

transferred. We have repeatedly transferred them in the most approved manner, from the old box to the Vermont Hive, by means of an apparatus constructed for that purpose; but the operation always resulted in the loss of the colony afterwards, or a swarm which would have come from them.

When it is necessary to transfer a swarm from one Vermont Hive to another of the same kind, insert drawer No. 1 into their chamber in the spring, say the first of May. If they fill the drawer, let it remain there; if they need to be changed to a new hive, they will recede from the lower apartment and make the drawer their winter-quarters, which should remain until warm weather has so far advanced as to afford them bread. Then they may be removed to an empty hive, as directed in the former part of this chapter. Now the drawer contains no bread, and should remain in the old stock until the bees can provide themselves with a sufficient quantity of that article to feed their young bees with; for bread is not collected early enough and in sufficient quantities to feed their young as much as nature requires. If the bees fail in filling the drawer, one should be used that is filled by another swarm. Thus the aged and infirm stock is changed into the full vigor of youth by their own free act, without any compulsion of their owner.

If bees are transferred from the old box hive, or from any other to the Vermont Hive, except as described in the foregoing remarks, it should be done immediately before, or forthwith after the second swarm has left the hive. Then, both old and young should be colonized together, which is very easily done by moving the old stock, and placing the new one where that stood. Now invert the old hive and rap out the bees, or take out its contents: the bees will return and enter the new hive. This should be done as

soon as the young swarm can be hived. If the operation is performed before first swarming, their owner will be sure to lose one swarm in the wanton destruction of eggs, larvæ and chrysalides; and if it is done after the first swarm leaves, before a queen is heard, he will get the bees without a queen, because the old queen leaves the hive with the first swarm, and another is not usually hatched sooner than seven, eight, or nine days after first swarming: and if transferring is delayed until the swarming season is through, the bees will not make a sufficient quantity of comb to cluster in, nor honey enough to sustain them through the following winter.

We would not be understood to approve of transferring from the old box until the comb is so old as to produce dwarfs. During the several years which have elapsed since our last edition was published, we have not discontinued our experiments in transferring bees; and it may be proper to remark that since, in Western Vermont, a great change in the seasons has transpired concerning the apiary, and bees have been unable to procure as much honey as formerly, we have done but little in transferring them according to the foregoing rules; yet we consider these rules unfailing, when the seasons are favorable for bees, though we think our practice for a few years has been better adapted to the wants and interests of the apiary. It is this:—We examine all the hives about the first of October, when all or nearly all the young bees are hatched; select such hives only as seem to need feeding, and after puffing one or two blasts of segar-smoke at the bottom of the hive, remove it from its place, and turn it bottom upwards. Remove, with a pruning-knife, all the honey and comb, and brush the bees into a body, upon the ground. After securing the honey from robbers, take away the queen, and the swarm will be soon found to enter the hives of their nearest neighbors, where they will

peacefully and quietly remain, aiding the inmates of their new home, by increasing, in proportion to their numbers, the animal heat so necessary to preserve the bees from freezing, and keeping the honey warm and nutritive. This kind of transferring should be performed in the early part of a warm, pleasant day. It is proper to add, that, in case the queen is allowed to remain among the bees, the whole swarm will attempt to enter, in a body, some other hive, and the object will be defeated, since many will fall on both sides, in their struggle to enter the hive and live with their neighbors. We have often seen them thus attempt an entrance, when a sufficient number of bees would perish, at the mouths of the several hives, to make an entire swarm. Though greatly reduced in numbers, they finally alighted on a fence post, but as soon as we had removed the queen, they quietly dispersed among the neighboring hives, where they remained as one family, living and laboring in perfect harmony.

GENERAL OBSERVATIONS.

IN the preceding part of this work, we have by no means attempted to give a complete history of the nature, instincts, and habits of bees. Every thing which had not some bearing upon their successful culture has been purposely omitted. The reader who is curious in such matters is referred to writers more speculative and voluminous. But a few general remarks may give connection to the facts which have been necessarily detailed under separate chapters, and render the principles inculcated more easily understood.

The wonderful economy of the honey-bee early attracted the attention of mankind. Other insects, as, for instance, the ant and hornet, possess instincts which equally excite our admiration. But the delicious luxury afforded by the labor of the honey-bee at a very early period rendered it the peculiar care of man, who cultivates the inferior creatures only that they may minister to his wants or his pleasures. The first cultivation of bees is unknown. Very many of their habits were known to the ancients, but their knowledge was combined with many fanciful and superstitious notions.


Modern naturalists have added much to our stock of information on this subject, but many things are now assumed without sufficient proof by observation; and the great mass of persons who cultivate bees still adhere to many superstitious notions taught by ancient writers, and traditions of our forefathers. Many things are yet, without doubt, to be learned. We have not discontinued our experiments, and whatever observations we may make, we shall communicate to the

public. We do not fear that they will be contradictory to the principles we have already laid down, as they have already been abundantly verified.

We shall not attempt to describe the structure of the comb; its shape is familiar to all. It will be sufficient to say, that the utmost economy of space and material is observed, and its mathematical accuracy has excited the wonder of philosophers.

The structure of the worker is too well understood by every owner of bees to need a very particular description. So also of the drone; and the queen has already been sufficiently described to enable any one to select her out from among her subjects. [Cuts of the three classes of bees can be found in the Appendix to this work.] If any further description is desired, the observer can easily satisfy himself by the use of a microscope. Every swarm of bees is composed of three classes or sorts, to wit: one queen, or female, drones, or males, and neuters, or workers. The queen is the only female in the hive, and lays all the eggs from which all the young bees are raised to replenish their colony. She possesses no authority over them, other than that of influence which is derived from the fact that she is the mother of all the bees; and their instinct teaches them that they are wholly dependent on her to propagate their species, and they treat her with the greatest kindness, tenderness and reverence, and manifest at all times the most sincere attachment to her by feeding her, and guarding her from all danger.


The government of a hive of bees is not one of force, but one of mutual benefit, as a republican government should be. The instincts of the different orders of bees are so made to harmonize, that, while each seeks his own good and pleasure, he promotes that of others. The queen is as much the creature of necessity as her subjects



If she finds empty cells in the hive, during the breeding season, she will deposit eggs there, because it is her instinct and nature to do so; and the nature of the workers prompts them to take care and nurse all the young *larvæ*, labor and collect food for their sustenance, guard and protect their habitations, and do and perform all things in due obedience, not to the commands of the queen, but to their own peculiar instinct.

It is found by experiment that bees will go to work, and continue their labors with perfect regularity, with a dead queen, as long as she is confined in the hive in such a manner that the bees will keep her in motion; but, as she is the only female in the hive, no eggs will be laid, no brood-comb made, and no young bees raised: notwithstanding there are plenty of drones in the hive, as there are no grubs (*larvæ*) to consume the pollen, the comb will be unusually loaded with bread; and the bees will finally perish by the depredations of the moths, or want of animal heat in the winter, which is generated in the hive by a populous community only.

We have demonstrated these facts by various experiments; only one of which we will here record. On the 6th day of July, 1838, we took a queen from a first swarm out of the same hive that season, and inserted a common pin through her chest, which killed her immediately. We then confined the queen with the pin in the centre of a fine but very strong string, about eighteen inches in length, the ends of which we fastened at the two opposite corners of the hive, near the top, by means of little nails, in such a manner that her lifeless majesty was suspended on one side of the hive against the glass. We then let in the swarm and confined the bees in the hive, until they had found their sovereign, and clustered around her; this done, we withdrew the gate from the entrance of the hive, and gave the bees liberty to work.



This experiment clearly shows that there is no arbitrary government in a hive of bees, nor domineering power in the queen. Notwithstanding their sovereign was dead, yet the bees commenced making comb immediately, and continued their labors with perfect regularity as long as the queen remained in the hive; the queen being attached to the string in its centre, and the two ends of the string being confined at the top of the hive a dozen inches or more apart, two legs of a perfect right angle was formed, with her highness at the junction of its two legs; at the same time, the common working bees were constantly climbing the string, which kept the lifeless carcass of their venerated sovereign in constant motion. During the whole time of the process in this part of the experiment, both day and night, there were about a dozen working bees which stood around her majesty, with their heads directly towards her, seemingly in amazement, or holding a solemn council; at the same time, there were other bees showing their persevering industry, by endeavoring to loosen the string by cutting it off with their teeth so as to liberate their mistress from her unnatural confinement. Now, whether it was the intention of the bees to cut off the string to liberate their sovereign, and see whether she was living or not, or to remove the string as a nuisance to them, or drag their dead queen out of the hive, is more than we can determine; but one thing is certain: by the unremitting perseverance of the bees, on the 25th day of July, twenty days after hiving them, they did succeed in loosening the string, and the whole, string, pin, and lifeless carcass of their emaciated and dried-up sovereign, was found dragged out all together at the mouth of the hive, and the bees stopped work.

Another fact is demonstrated by this experiment, the knowledge of which we think to be of prime importance to all who are engaged in the cultivation of bees, which is this: no

young bees can be raised without a living and fruitful queen. In this instance, there were no eggs laid in the cells, nor young bees raised, and yet there were a plenty of drones in the hive during the whole twenty days, and also during their recess from labor, after the dead queen was dragged out of the hive, until the season for their general massacre arrived. We had five full observing glass hives at the same time in full operation, varying in hiving swarms in them two or three days.

One, hived July 2d, had eggs laid the first night: eggs were seen in some of the cells before they were to exceed the eighth of an inch in depth, and chrysalides were forming on the tenth day after hiving. In other hives, chrysalides were not discovered until the thirteenth day.

That no brood-comb will ever be made in a hive of bees unless eggs are laid in the cells, is another fact which is corroborated by other experiments in the case. Bees usually make comb containing coarse cells in some sheets, and fine ones in others, either of which are proper receptacles for storing honey or bread; but it does not appear that they ever make either exclusively for raising young bees, unless they discover eggs in the cells. Then, if the cells are too deep, the bees cut them down to their proper depth, which is about five-eighths or three-fourths of an inch for workers; if too shallow, they build on and extend them to the same depth in new combs, and never alter them afterwards, unless they were broken by accident or otherwise injured; so with the coarse cells which are proper for drones, and are always used for raising that class of bees; when empty of honey, eggs are laid in them, and they are altered to an inch in depth. These cells are more liable to be changed after the escape of the young drones, to suit the convenience of the bees for storing honey.

The queen's cell is never made except when a young queen is wanted. Although, in frequent instances, there are several of them made in a hive of bees in a season, yet but one queen is ever raised in a cell. They are usually attached to the side of the comb of workers, by changing three workers' cells into one, for a queen: they are made perfectly round, pointing downwards, and are always destroyed by the bees, by being worked down to a mere knob, with a hole about the size of a common gold bead, very soon after the young queen has made her escape from her cell. But this experiment illustrates another fact which ought here to be mentioned; and, in order to examine the comb with great particularity, we devised means to exhaust the air in the hive of a portion of its vitality, which caused the bees to descend upon the bottom board, leaving but few among the combs, which greatly facilitated a minute inspection of the whole interior of the hive; whereupon it was discovered that the comb was unusually loaded with the pollen of flowers. This clearly proves (as it agrees with other experiments directed to the same point) that the pollen of flowers, or bee-bread, is designed for the larvæ only, and that perfect bees never eat it; hence it is easily seen why an old hive of bees becomes so heavily laden with that article of food, a superabundance of which is worse than useless to them, and for which, we think we have discovered a remedy.

Another fact, of some importance to the bee-manager, proved by this experiment, and corroborating other testimony, is this: notwithstanding the queen leads in swarming out of the old stock, yet the bees usually assume the lead after they are out of the hive, and the queen is usually among those who alight last. It is true, indeed, that the bees will return to the parent hive, unless their sovereign is heard in the air. We have known many swarms to alight,

cluster in a body, and remain several minutes for her, when we stood very near them, at the time they were alighting. The queen is usually rather shy, and seems inclined to conceal herself from human observation, extremely timid, and a little jealous of being caught.

In this experiment, the queen was suspended on one side of the hive against the glass: the bees by accident clustered in a body on the opposite side of the hive: some twenty or thirty minutes after the bees were hived, we found many of them clustered and clustering about the entrance of the hive, on its outside. On opening the door, we observed but two bees that had found their sovereign. We immediately brushed all the bees into the hive and confined them therein, with the expectation that, when the bees found their queen was not with them, nor any probability of her coming, they would grow restless, and run around the hive to find their way out, and would come across their sovereign: they did so, and in the course of an hour, we found her whole colony clustered around her.

Now, as we had observed all the material facts in the case for twenty days, and observed also their perfect idleness and inactivity during the whole time of ten days after the bees had cleared the hive of their lifeless queen, we determined to let the swarm perish in their own way. But, as we were looking into the hive through the glass, we discovered a moth miller attempting to deposit her eggs among the comb, without the least resistance on the part of the bees. This discovery inspired our mind with new resolutions. That the bees must inevitably perish by the moth; that "monster in gaudy hue," was so repugnant to our feelings, that we determined to supply them with another queen. But the season had already advanced to August 5th, full two weeks after the close of the swarming-season, so that no young queens

could be caught, and we had not taken the precaution to preserve extra queens that season; hence, a good old hive of bees must be sacrificed, in order to preserve the one we had been experimenting with. But the whole object was not to save one feeble swarm by sacrificing a good one. It was to follow up our system of management, in compelling the bees to make themselves a queen, when their owner knows they need one. The hive selected was taken from the stand at noonday; we inverted it and took out all the comb, honey and bees, (the bees went into the adjoining hives.) This done, we selected brood-comb of workers only, containing eggs, larvæ, and chrysalides, in all their stages; placed the comb carefully in a drawer, in its natural position; and inserted the same into the chamber of the hive, so that the bees could repair their loss, by making a queen in their own way, and according to the directions in the foregoing chapters. They did so, and on the eighth day they had a queen. And here we ought to record the fact, that the bees, on the third day after they were supplied with young broods, resumed all their natural habits, labored with seemingly redoubled vigilance, obtained a complete victory over the moths, expelled every one of them from their tenement, and protected their hive as usual.

On expelling the bees from the comb on the 21st day of August, (queen eight days old,) we found eggs in some of the cells, and the bees changing them into brood-comb as fast as possible. Notwithstanding their entire overthrow was for a while predicted, yet, by furnishing them grubs of workers, they have supplied themselves with a healthy and fruitful queen, and we had the satisfaction of seeing them replenish their stock with young bees, which was already somewhat reduced by the loss of many of their companions, by being caught by the birds, and lost by other casualties,

and the bees in as healthy and prosperous condition as any of our hives this 18th day of March, 1840.

In this experiment we were a little disappointed in one respect only, which originated in our own habits, instead of that of the bees; inasmuch as it has been our usual practice to compel the bees to make extra queens in small drawers, by their removal from the parent stock, and also by dividing them for new colonies, without swarming, by the use of the large drawer. In this case, we supposed that the bees would enter the drawer, erect a cell, and raise their sovereign in the chamber; but, instead of doing this, they made their arrangements below, where the main colony were located, and carried down the larvæ, where it was more convenient for them to exercise their peculiar instinctive ingenuity among new comb of their own manufacture.

The peculiar instinct of the bees as manifested by them, in changing the nature of grubs of workers to perfect females or queens, to fill vacancies occasioned by the departure of the old queen with the swarm, and other vacated cases, is the foundation of their whole economy.

That bees have the power to convert the grub or larva of a worker to a queen, there cannot be a doubt; but, whether the larva of a drone can be changed by them to a queen, yet remains to be proved by experiment, which has never been done to my knowledge. It is believed that all the eggs, when laid by the queen, are of one class or sex; for a whole litter of eggs is frequently deposited in one kind of cells, and all hatch out workers, or drones, according to the size of the cells where they are raised. It is found, also, that the queen in some instances deposits her eggs promiscuously, some in drone-cells, and others in workers', or in any cells that are found empty, and the young larvæ are nursed as the instincts of the bees are directed by the cell that contains them.

Now, as the queen becomes perfect, and usually hatches, in seven or eight days after the larva is removed from the workers to the queen's cell, and that, too, several days sooner than her sister's larvæ, that remain in their cells and become workers, we are inclined to believe that all the eggs are naturally females in their original state, and the larva that is removed for a queen is nursed on a more pungent food than others, and facilitates a more perfect development of the female organs, and hastens her growth to a perfect winged insect, even several days earlier than the drone can be, which hatches three or four days earlier than the workers.

The extreme animosity which exists among females in this tribe of insects is so great, that but one queen can live together in a hive any great length of time before a battle must be fought between them, and a victory won, so as to exclude all competition to royalty, as explained in Chapter II. Until we tried some experiments directed to this point, we could not see why it might not be fatal to both conflicting parties, as it is to the duellists when both shots take effect. But the immutable and unerring law of nature has its fixed principles, which secures one of them from the deadly weapon of the other at the time the fatal wound is inflicted. We have often seen this wonderful fact, by taking two queens and placing them in a glass cylinder, so we could observe every motion; and in all cases (which are many) the conflict is the same, when they have fairly clenched each other. Although the struggle is much longer in its duration with different queens, yet but one weapon is ever used, and but one manner of using it. We have known hostilities to commence instantly when introduced to each other; and, again, with others, we thought we could discover a kind of shyness, like two men who would be glad to avoid the

duel if their honor would not suffer, and remain some time looking at each other, in a sort of reflection before the deadly conflict. We have known them to make an assault upon each other, and lose their hold unhurt, and place themselves in their former positions at the two opposite sides of the cylinder, the motions all done quick as sight. When the two conflicting queens have once grappled, and made their hold firm and strong, this hold is never broken until the sharpness of death has dislocated one of them, by unnerving her of every bodily and mental feeling. This also is instantaneous. The queens, while in the conflict, are hugged breast to breast, facing each other, with their legs and arms around upon the back of each in such a manner as to bring their bodies in close contact as possible, one lying on her right side and the other on her left. Now the reader will see that the abdomen of each is close to and fronting the other. Now comes the struggle, which is tremendous: they have not power to curve their abdomen back, nor sidewise very much; neither would they do either, if they could, for it would only give the competitor the advantage, should one do either. Thus the whole victory depends entirely on the curve of the abdomen. Hence the queen possessing superior strength or agility, or both, curves her body and enters the fatal sting into the lower region of the chest of her antagonist, which kills her in an instant, and the two bees are apart the next. The least motion in the conquered queen is not often seen, except a slight trembling of her limbs.

In speaking of multiplying swarms to any desirable extent, without swarming, as directed in Chapter IX., we ought here to remark that the same instincts of the bees are manifested in creating a queen for themselves in one of the divisions, as when the throne of royalty is vacated by the de-

parture of the first swarm, as in Chapter II. That bees may be increased to any desirable extent, without swarming, there is not a doubt. In northern latitudes, however, the seasons are too short to make very rapid advances. We have tried this experiment several times, and have not yet failed. We have divided them, and received a swarm from one of the divisions the same season. We have transferred and divided the same season with perfect success; and thus far we have not failed in a single trial, when the experiments were made in accordance with the rules set forth in this Manual.

Artificial heat is not as favorable to the breeding of bees, nor to their health and lives, as natural heat. We have set them to breeding in January, but we found the heat produced by the fire, though moderate, in the course of two weeks caused death in many of the old bees, and a chill destroyed the larvæ, and we were compelled to relinquish the winter enterprise as unprofitable business. We are inclined to think that a room may be so constructed, and warmed by heated air, that swarms may be forwarded in the spring to great advantage.

The drone is, no doubt, the male-bee, notwithstanding the sexual union has never been witnessed by any man; yet so many experiments have been tried, and observations made, that but little doubt can be entertained of its truth. That the sexual intercourse takes place high in the air, is very probable, from the fact that we have seen an attempt at copulation by the drone with the queen, on their return from an excursion in the air, before she could enter the hive; and other insects of the fly tribe do copulate in the air, when on the wing, as we have repeatedly seen. That the drone is the male bee is probable, from the fact that the drones are not all massacred at once. In a minute examination of several hives in the winter and spring, it was found that some drones

were kept through the winter. We have known hives to contain from one to three, while others had none; but this is not surprising to us, when it is known that they are their own masters after the season for the general massacre arrives, and are known to take up their residence in any hive that will receive them, and again take their departure at pleasure, and make any hive their home. The drone, no doubt, has other offices and other duties to perform still veiled in mystery, which we hope, by a course of observations, to discover in process of time.

It may be possible that it is with bees as it is with animals, or even man. Here nature seems to have her fixed laws so far, that the sexes are very near equally divided. But in the case of all domesticated animals, as well as wild ones, but very few males in proportion to females appear to be needed; and man, who has had "dominion" given him, exercises his power to "alter," kill, or destroy. May it not be proper for him to do so here? If the drone has no important uses further than the male influence with the queen, the drafts they make upon the stores of the hive must be exceeding burthensome, and appears to warrant their almost entire destruction. (See Appendix, on killing drones.)

The importance of taking the queens from all small and late swarms, and returning them to the original stock, cannot be too much insisted upon. It constitutes a very important feature in my system of managing bees. Even first swarms that are late had better be compelled to remain in the parent hive. (See Appendix on preventing excessive swarming.) The prosperity of a hive of bees depends in a great degree upon their number being kept full. They are their own best defenders. Their number not only protects them from the depredations of the moth, and the robberies of other swarms stronger, but the animal heat which is gene-

rated in the hive by a populous community, protects the comb from moulding, and the bees from freezing in the coldest weather. But the apiarian derives another advantage by keeping his hives full of bees; he secures a larger quantity of honey from a full swarm than from many small ones. The time for making much honey does not usually last more than twenty or thirty days in Vermont, and the greatest proportion of honey that is deposited in the hive for winter use is collected in fifteen or twenty days. This renders it very important that the attention of the old stock should not be called off from gathering honey at this time, to guard their hive from the attacks of moths, to which it is left exposed by the desertion of that part of their body which has accompanied the queen to constitute a new swarm. Hives that are well stocked with bees in the spring, swarm much earlier than feeble ones, and are able to use the best of the season to great advantage.

In speaking of the advantages of a large colony, we would not be understood to approve of the plan of those persons who so far depart from the economy of nature as to raise bees in a chamber, or in any way where their colonies will much exceed fifteen or sixteen quarts of bees.

As there are several millions of dollars' worth of the purest sweet lost in the United States every year for want of bees to save it, and skill to manage the bees, it is to be regretted that so many of our fellow-citizens engaged in their culture should keep them in non-swarmling colonies. If the whole mass of bee-cultivators should adopt this system, it would be but a few years before we should be compelled to adopt the practice of the survivors of Hippocrates, by collecting bees from the crevices of rocks and hollow trees, to bring them again into a state of cultivation.

Bees are creatures of habit, and the exercise of caution in

managing them is required. A stock of bees should be placed where they are to stand through the season before they form habits of location, which will take place soon after they commence their labors in the spring. They learn their home by the objects surrounding them in the immediate vicinity of the hive. Moving them (unless they are carried beyond their knowledge) is often fatal to them. The old bees forget their new location, and on their return, when collecting stores, they haze about where they formerly stood, and perish. We have known some fine stocks ruined by moving them six feet, and from that to a mile and a half. It is better to move them before swarming than afterwards. The old bees only will be lost. As the young ones are constantly hatching, their habits will be formed at the new stand, and the comb will not be as likely to become vacated, so as to afford opportunity to the moths to occupy any part of their ground.

Swarms, when first hived, may be moved at pleasure without loss of bees, admitting they are all in the hive: their habits will be formed in exact proportion to their labors. The first bee that empties his sac and goes forth in search of food, is the one whose habits are first established. We have observed many bees to cluster near the place where the hive stood, but a few hours after hiving, and perish. Now if the swarm had been placed in the apiary immediately after they were hived, the number of bees found there would have been less.

Bees may be moved at pleasure at any season of the year, if they are carried several miles, so as to be beyond their knowledge of the country. They may be carried long journeys by travelling nights only, and affording them opportunity to labor and collect food in the daytime.

The importance of this part of bee-management is the

only apology we can make for dwelling so long on this point. We have known many to suffer serious losses in consequence of moving their bees after they were well settled in their labors.

Bees should never be irritated under any pretence whatever. They should be treated with attention and kindness. They should be kept undisturbed by cattle and all other annoyances, so that they may be approached at any time with safety.

An apiary should be so situated, that swarming may be observed, and at the same time where the bees can obtain food easily, and in great abundance. A bee-house should be so constructed as to secure the hives perfectly from the rays of the sun, and weather, and well saturated inside and out at least once a year with whitewash made of lime, which is a great preventive to the collection of cobwebs, moths, and other insects; at the same time it promotes the health and vigor of the bees. Whitewash made of lime makes a good paint for hives, particularly bottom boards, which should be well washed over with it every spring. All the light the bees can have about the hive is necessary, to induce them to swarm early in the season; and a plenty of good air (*not air exhausted of its vitality*) is absolutely necessary to promote their health, prevent them from acquiring habits of indolence, and hostile feelings; at the same time, a strong current of air in the immediate region of the hive, near the entrance, where the bees alight, must be avoided: otherwise, when the bees slack up their speed to alight, the wind will blow them so far from the hive that many of them fall and perish.

Much depends on the construction of the house, as well as the hive. It has been a general practice to front bee-houses either to the east or south. This doctrine should be exploded, with all other whims. Apiaries should be so situ-

ated as to be convenient to their owner as much as any other buildings. We have them fronting towards all the cardinal points, but can distinguish no difference in their prosperity.

Young swarms should be scattered away from their parent stock at least eight feet, so as to avoid mistakes frequently made by the bees by entering the old hive, on their return from the fields, before they are well located. But there is another reason of the highest importance, which should not be forgotten by the bee-manager: the old queen goes out with the swarm, and stands at the head of the new colony. Now, as her habits of location are formed at the old stand, it is not uncommon for her to make a mistake, on returning from an excursion in the air, and enter the parent hive where she has formerly resided; and her whole community follow; which so deranges their organization, that perfect harmony is not restored until too late in the season for new communities to form to any profit to themselves or their owner. If they are not housed, they should be set in a frame, and so covered as to exclude the sun and weather from the hive. As a general rule, bees flourish better in valleys than on the high hills contiguous to them, on account of bearing their burthens home with greater ease descending than ascending with a heavy load.

In speaking of the different qualities of honey in a former chapter of this Manual, it is proper to remark that every tree and plant yielding it, produces honey of its kind, possessing properties of the same nature of its parent plant, many qualities of which may be designated by their complexions or color in the full observing Vermont Hive, and may be separated off in their several parcels, the uses of which might be of the highest importance in the practice of medicine. Honey collected from poisonous plants is poison, and should never

be taken upon the human stomach unless administered by a person well skilled in the medical qualities it possesses, and for appropriate remedies. The effect of honey on the human constitution is unlike most kinds of food, inasmuch as that but a small proportion of it, *if any*, digests and passes off by evacuations of the bowels. In man, it mingles with the blood, and passes off in urine; but in the bee, it is principally thrown off by respiration and perspiration, and forms a vapor: otherwise, from the great quantity of honey consumed by the bees during their long confinement in the winter, they would present in the spring, instead of a clean, healthy tenement of bees, comb, and honey, a spectacle too loathsome to need description.

It has been said in a former chapter that bees carry in their stomachs in sacs a good supply of honey when they swarm. It is proper, then, here to remark that wax is made by design; and yet it is of natural growth, forced into existence by circumstances. In this instance, the instinct of the bee excites our admiration as much as in any part of their economy, inasmuch as the bees are compelled to exclude a portion of the atmosphere from their bodies, in order to raise a certain degree of heat absolutely necessary to facilitate that kind of secretion in the stomachs of the working bees which converts a portion of the honey with which they are laden into wax, and by its exudation appears upon the surface of the bee's body. In short, the whole system of natural instincts of the bee magnifies the wisdom of their Creator. If human reason could be made to exhibit this perfection, we should have no more quarrels between rich and poor, or struggles between the subject and patronage and power. But all must be free to choose between right and wrong; and this has become corrupted and imperfect by moral depravity. May the time soon come when order shall

be restored to the moral, as it has always prevailed in the physical world.

It has been our intention, at some future time, to prepare for the public a full account of the instincts and habits of the honey-bee, but we have not yet found time to do so.

It is not surprising that this branch of rural economy, in consequence of the depredations of the moth, is so much neglected. Notwithstanding, in some parts of our country, the business of managing bees has been entirely abandoned for years, we are confident they may be cultivated in such a manner as to render them more profitable to their owners than any branch of agriculture, in proportion to the capital necessary to be invested in their stock.

It does not require a large land investment, nor fences; nor does it require the owner to labor through the summer to support them through the winter. Care is indeed necessary; but a child or superannuated person can perform most of the duties of an apiarian. The cobwebs must be kept away from the immediate vicinity of the hive, and all other annoyances removed.

The management of bees is a delightful employment, and may be pursued with the best success in cities and villages, as well as towns and country. It is a source of great amusement, as well as comfort and profit. They collect honey and bread from most kinds of forest trees, as well as garden flowers, orchards, forests, and fields;—all contribute to their wants, and their owner is gratified with a taste of the whole. Sweet mignonette cannot be too highly recommended. This plant is easily cultivated by drills in the garden, and is one of the finest and richest flowers in the world from which the honey-bee can extract its food.

Most trees, plants, and shrubs yield honey and pollen from their blossoms. Honey lies at the base of the filament in

the bloom, while the pollen or farina is found slightly adhering to the stamens, around the exterior of its pistil. Some flowers are male, and others are female, with some few exceptions, as, for instance, wheat, rye, and perhaps some other of the small grains, and some varieties of the strawberry, in which both sexes appear to exist in the same blossom. But most plants, as well as trees, produce blossoms of one sex only, and require some other agency than uncertain wind to transmit the pollen from the stamens of the male blossom to the pistil of the female, in order to stimulate it, and produce fructification. Here appears to be a striking display of infinite design, in the supply of insect agency to do this service. Honey is a natural secretion, in greater or less quantities, in nearly all blossoms, and lies at the base or farther extremity of the flower; provided here, no doubt, to allure all honey-loving insects to visit it in their search for food. All winged insects that seek honey for their subsistence are provided with a proboscis, or honey-sucker, which they use in their search for food as they pass from one flower to another; and, at the same time, when they are compelled to search deep to extract the honey, their bodies and legs become smeared with pollen from the stamens. Thus, while they continue their labors among the flowers, they loosen off portions of the pollen from the male upon the pistil of the female flowers; perhaps unintentionally on the part of the insect, yet it providentially engenders the blossom, and produces fructification. As the pollen of flowers from trees and plants, differing in quality, is thus mingled by the winds and insect agency, the different varieties of each are produced, otherwise every tree and plant would produce the same kind as the matron when reared from the seed. Only trees and plants of their own genera will mix. For instance, a peach tree will produce its like from its seed, either by wind or in-

sect agency, (when away from the influence of all others of its kind.) Its seed is the stone of the matron fruit. So, also, with the potato. But when many varieties are reared in close proximity with each other, an almost endless variety is produced by the influence of the wind and insect agency, from the same seed. As a further illustration of Divine wisdom in this matter, we find insects of different genera, and varying greatly in size, adapted to all the varieties of honey-bearing plants. The honey-bee can rest upon the white clover, and reach with its proboscis to the farther extremity of the blossom, so as to extract the honey. So also in most, if not all, the blossoms of fruit and forest trees, as well as plants producing flowers much smaller than the white clover; but for plants too small for the honey-bee to rest upon, smaller insects are provided. So, likewise, in regard to larger and deeper blossoms; for instance, the red clover, lilac, and others, which contain much honey; but the honey-bee is unable to reach it with its short proboscis. So the humble-bee is provided, and the lady-bird is occasionally observed seeking for her share. Then, again, the hollyhock, honeysuckle, and perhaps other plants that secrete honey in great abundance; yet it lies so deep at the base of the filaments, or honey-cups, that no winged insect can reach it; then the humming-bird is provided to do this important service.

We cannot take leave of the cultivator of bees who has adopted this system as his guide, without impressing upon him the necessity of fully understanding the rules and the principles upon which they are founded. No rule can be made perfectly absolute; contingencies must be provided for: yet in nearly every case they will be found to be safe and unfailing in their application.

QUESTIONS TO BEE-OWNERS.

EVERY bee-owner should be able to answer the following questions in the affirmative, if he wishes to make his bees profitable :

Have you weighed and marked the weight on all your hives, before using them ? (p. 61.)

Have you scratched the under side of the chamber floor ? (p. 15.)

Did you secure the hive from the rays of the sun at the time of hiving the bees ? (p. 29.)

Did you let the bees into the drawers at the time of hiving all your large swarms ? (p. 29.)

Did you close the hive, and move it as directed ? (p. 30.)

Have you let down the bottom board, and turned the drawers, as directed ? (p. 30.)

Have you removed your honey before buckwheat is in blossom ? (p. 42.)

Have you taken the queens from all your late swarms ? (pp. 53, 58, 90, 91.)

Have you turned your drawers, so as to prevent the breath of the bees from entering them in September ?— (p. 69.)

Have you fed your destitute stocks in October ? (pp. 61, 62, 63, 64.)

Have you weighed your stock hives, and is there at least 25 lbs. in addition to the weight of the hive, on the 1st of December ? (p. 63.)

.Have you been particular to see that all your hives are properly ventilated, and the bees kept lively during cold weather? (pp. 69, 70.)

Have you turned the drawers to all your stock hives, so that the bees can enter them as soon as blossoms are seen in the spring? (p. 42.)

Have you visited your bees, and examined their true condition, two or three times in each week through the whole year?

APPENDIX.

DESCRIPTION OF THE THREE CLASSES OF BEES.



THE QUEEN BEE,

From the important relation she sustains to the colony, seems first to claim our attention. She is the acknowledged sovereign and the mother of her subjects, and by them she is protected and cared for with a true and genuine loyalty. She is much larger and longer than the working bee: her abdomen is large and of a conelike shape, being larger in the swarming season than other times. Her wings are very short proportionally: her color is much darker than the worker, sometimes nearly black, except her belly, which is of a dark orange: by this color she may be distinguished in a cluster where her other peculiarities cannot be discovered. Her movements are slower and more stately than those of the worker. Her sting is larger and of a curved form.

HER OFFICE.

She lays all the eggs for the propagation of her species, depositing from one to two hundred daily, varying according to the temperature which she enjoys, produced by the state of the weather or otherwise. She commences laying as soon as the genial influence of spring renders the temperature fit for her purpose: she will also lay in winter if the hive is kept sufficiently warm, and properly ventilated.



THE WORKING BEE

Is next in order: it is smaller than either the Queen or Drone, being about half an inch in length, covered with fine hair, which aids it in carrying the farina which it gathers from the flowers. On the posterior legs is a cavity or basket for the reception of the pollen or bee-bread. Dissection has shown that its stomach is more capacious than those of other insects. The honey bee is susceptible of an increase in size, as is evident from the fact that each bee has a honey-sac or pocket, in which they store their honey, from which it is disgorged into those cells which are intended for its reception. Each bee has a series of wax-pockets or segments under its abdomen, which can be so distended as to show the wax or scales, as they begin to form; and in fact these scales may often be seen without pressure.

The scales of wax thus prepared or formed, as Dr. Bevan states, are applied by them to the roof or bottom of the hive,

as the case may be, and thus a block is formed or raised of semi-lenticular shape, thick at the top, and tapering towards the edges. When of sufficient size, a cell is sculptured on one side of it by the wax-working bees, who relieve one another in succession, sometimes to the number of twenty. Before the cell is completely fashioned, at the back and on each side of this first cell, two others are sketched out and excavated. By this proceeding the foundations of two cells are laid, the line betwixt them corresponding with the centre of the opposite cell. As the comb extends, the first excavations are rendered deeper and broader; and when the pyramidal base is formed, the bees build up walls from its edges, so as to complete what may be called the prismatic part of the cells. Every succeeding row of cells is formed by precisely similar steps, until there is sufficient scope for the simultaneous employment of the whole cluster. "The bee," says Richardson, "respires by means of *spiracles* or breathing-holes, situated in the thorax, beneath and behind the wings. Through these air is admitted into the thorax for the purpose of oxygenizing the circulating system; for oxygen is no less essential to the well-being of the bee—nay, to its very existence—than it is to that of man. Will not this convince every reader of the necessity which exists of duly ventilating the hive or bee-boxes?—an operation so much neglected, and yet so important a feature in the proper and remunerative management of these insects."



DRONES

Are larger than the queen or working bee: their head is more round, eyes more full. They have no sting. They make more noise in flying than the other bees. They are the males of the hive. How or when the intercourse between the drone and the queen takes place has long been a matter of speculation and controversy among philosophers; but the most approved authors agree that it takes place in the air. During the summer they are dispersed through the different parts of the hive, for what purpose is not known. They may perform some offices there, but it is probable that their only purpose is the impregnation of the queen during her aerial flight.

Towards the close of the season they assemble in groups, and are soon attacked by the working bees and killed. They resist the attacks of their executioners to the utmost of their power, but by the great number of their assailants and their advantages in regard to weapons, they are soon despatched: a few are sometimes left in the case of the loss of a queen, or if the queen is not in a healthy condition, for the purpose of the impregnation of a young sovereign if the old one dies. When a colony is in a healthy condition, drones are never found after the general massacre.

Thus we find the several classes of bees possessed of many physical and instinctive peculiarities, most admirably adapted to their purposes; teaching us that in the minutest

portions of creation there is design and perfect fitness worthy of their Divine Author.

From the earliest ages the honey bee has furnished a most interesting study to the naturalist and the philosopher. Men of superior intellectual endowments and mental culture have found here a subject for deep and earnest contemplation. Indeed, all who may study the habits of this wonderful insect and witness its curious operations may peruse an instructive page in the Book of Nature, and trace therein the glorious handiwork of God. And not only does the science of the honey-bee furnish us profitable moral lessons, but an application of the principles of its culture is often a fruitful source of pecuniary profit.

The author of the foregoing pages, having enjoyed the benefit of a long experience, during which he has patiently and experimentally studied the nature and economy of the honey bee, and witnessed the ravages of its most destructive enemy, the moth, believes that an era in the management of the apiary will occur not far hence, in which the theory he propounded some twenty years since, in his "Manual on Bees," setting forth the *rationale* of swarming, and the effect of damp and rainy weather upon second and after swarms, will be better understood by the majority of culturists. May the "book-learning" of the past dawn auspiciously upon the present, lead the persevering apiarist along the path to success, and illumine those understanding which are darkened by the prevalent error that this calling is unproductive of pecuniary advantages.

We have ever believed that the objections often urged against this pursuit, and which have really rendered it so precarious in the hands of many, can be wholly removed, and that it may eventually become an important branch of rural economy.

From these considerations we are now led to the inquiry ; What is, and has been the most fruitful source of trouble in the apiary ? We answer, first, excessive swarming ; second, the moth miller ; third, the saccharine substance of flowers dries up so soon that the bees in the stock hives are unable to collect a winter's supply, causing disease or inducing robberies among the swarms, which often seem disposed, like men, to prey upon the wealth of others. This last seldom occurs when a more honest means of securing a livelihood is afforded them, unless, however, their predatory propensities are excited by the odor of the honey which drips down among the ranges of comb, to the bottom of the improperly ventilated hives. It sometimes happens that the comb is separated from the sides of the hive by the excess of animal heat within, and the rays of the sun without, which often causes the contents to melt down, unless the swarm remains outside until attacked by its neighbors, or the breach is repaired. Fourth, the young swarms are called from their work of collecting honey and building comb, (when first introduced into their new tenement,) to prepare the inside of the hive for the rich and delicious deposit, and the honey season is often past before this task is completed. Fifth, bees are liable in winter to freeze, on account of partitions in the hive : (the separations formed by the ranges of comb are *bad* enough.) We have frequently known bees perish in some parts of the old rectangular "box hive," while the rest of the swarm, which inhabited the other portions, would remain brisk and lively. But some men cannot be satisfied with a hive of the proper form and dimensions, but will crowd their bees into small boxes, and in return get "goose-egg swarms," of no profit whatever ; or they will use flour-barrels, cut open in the middle, expecting in this way to reap great harvests from

their "four-story hives;" while others are constantly changing the "brood-comb," or transferring their bees into the moth-traps built in what are improperly styled hives.

It has been often found absolutely necessary to prevent the issuing of second swarms, but no efficient method has been known until the introduction of our hives, nor has any way been discovered, whereby the weaker swarms might be protected from the incursions of their more powerful neighbors. It was also necessary to confine the bees in the hive during the coldest weather, to prevent their being chilled to death by falling upon the snow. The miller also claimed the apiary as its playground, and, from the swiftness of its movements, possessed a great advantage over the bee. The drones, too, have always enjoyed their season, hovering about the hives, not unlike the loafers around our country hotels, subsisting upon the stores of the rest, until they are destroyed to rid the industrious "workers" of their presence.

Our present inventions will, it is believed, effectually remove all these difficulties. It is proper that we first demonstrate the method by which we prevent excessive swarming. It is known that after the issuing of the first swarm, several queens are hatched, and that all the subsequent swarms are driven out by reason of the natural enmity which exists between them. If the first be detained until the rest are hatched, a battle ensues, in which all the queens save one are slain. By a device pertaining to our invention, (if it be desirable to prevent any further swarming,) the queens are confined in the hive until this strife for the ascendancy has taken place, the workers being allowed, meantime, to pass and repass at pleasure, the surviving sovereign has no disposition to leave, and the whole swarm quietly remains. By the same method the passage may be so gauged as to prevent the escape of all bees when laden

with honey, and in this way robberies are effectually prevented. Should it be asked how the bees can *enter* to deposit their load, and if such a method will not impede their operations, we answer that these robberies usually occur when no honey can be procured from other sources; hence at this time no bee enters its hive laden with the produce of the fields, and during these seasons of aggressive warfare, they are otherwise employed than in gathering nectar from the flowers. This appendage is so constructed that the supernumerary drones may be easily destroyed, thereby saving about twenty pounds of honey and saccharine matter for the winter's store, besides many cells which would otherwise be monopolized by them during the season. Some may object to killing them, upon the plea that nature would not have committed so palpable a blunder as to have created a larger number of *males* than is essential to the well-being of the swarm; but we maintain that they are not required by hundreds any more than a like proportion is necessary among the animals with which we "stock" our farms; at any rate, the drones may be destroyed after their flight with the queen has taken place. This usually occurs during the first twenty days of her existence, after which their services are no longer required, as every candid reader will readily admit. The drones are usually out about one o'clock on fair days. If the passages into the hives are all closed save the graduated entrance, and this be adjusted to the size of the working bee, as it ordinarily passes to and fro, the drones may be made to pass under the bottom board, and being shut out, can be easily destroyed by inverting a screen over them and exposing them to the fumes of sulphur. By destroying them at the time when the second and third swarms usually appear, a great amount of honey may be saved which would otherwise be consumed by them.

These hives have been introduced into several of the States, and have met the cordial approval of apiarists, who acknowledge that the principles they involve seem very likely to obviate those formidable difficulties to which we have adverted. It is well known that the rainy and unpleasant seasons intervening between the seventh and the sixteenth days after the first swarm appears, effectually prevent any subsequent swarming for that season.

Huber, the great naturalist, who flourished at the close of the eighteenth century, has placed this matter beyond question. The last season (1853) furnishes a case in point. We had a rain about the 27th of June, in the midst of the most plentiful swarming, which immediately ceased from that time, throughout the State of Vermont. This verified the predictions we expressed to several of our acquaintance, knowing, as we did, the almost invariable result of any such occurrence. By a timely application of these principles to the hive, we shall be enabled to prevent any further swarming, whenever it is desired, and thus to escape the destruction of the entire colony which often occurs in consequence.

The reader will recollect that the only means of retaining these strong colonies in the swarming-hives (and those hives are unprofitable from which swarms never issue) is by confining the queens by the device we proposed, for the reason that any other method of contracting the passage into the hive, than by a perpendicular concave entrance, adjusted to a convex lens, (or watch-crystal,) will impede the bees in their work, while our gauge, being composed of glass, will neither wear their wings nor remove the farina or "bee-bread" from their legs. There are many other advantages resulting from the use of our hives, with the modifications which have recently been invented. For instance: the centre cross-bars are so arranged as to suspend the swarm when first intro-

duced, in such a manner that they are obliged to work from the centre of the hive, and bring their whole energies to bear at the right time and place. In this manner, the ranges of comb may be so constructed that the bees in winter may pass from the centre into all parts of the hive, without traversing any broad and frosty surfaces, as in other cases.

The time for collecting honey, as before stated in this Manual, does not, in Vermont, usually exceed thirty days, and the entire amount required for wintering ordinary swarms may be gathered in from twelve to twenty. The solid timber and other melliferous sources being mostly removed in our country, it is highly important that every new swarm should be brought to work in the most expeditious manner.

It is an essential advantage of the glass-lined hive, that the bees, being unable to cluster upon the slippery surface, are obliged to build their comb upon the cross-bars in the centre of the hive, placing it edgewise to the sides and ventilators; and as they proceed, they will not spend the first two weeks in glueing over the surfaces, which operation may be better postponed until the *time* of the swarm is of less value, and the season farther advanced. There is no glueing to do until the comb is built out to the lining, when the bees will easily cement it to the surface, and this completes their winter dwelling. This is the reason why our hive requires only about half the time in filling which is usually employed when wooden ones of the same size are used.

Having acquainted the reader with some of the leading principles of our hive, we will now furnish him with a likeness of the same, in perspective; after which we will state, more minutely, the advantages it possesses over all other hives now in use.

Vermont Crystal Palace, or Flanders' Patent Bee Hive, (Patented October 25th, 1853.)

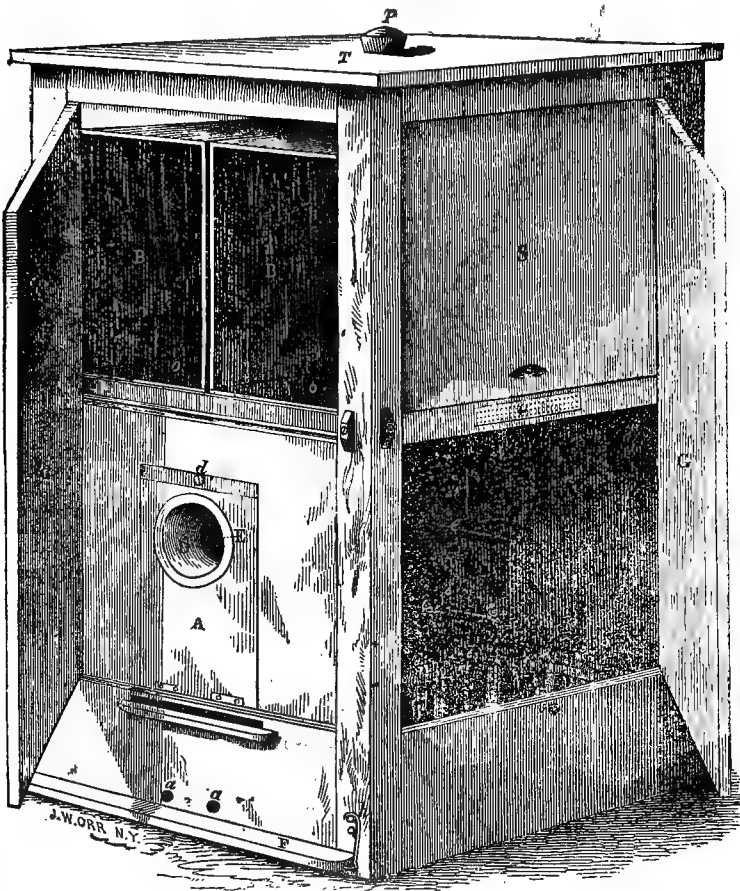


FIG. 1.

Fig. 1 is a front view of the Hive. *A* is the device to prevent robbing and unseasonable swarming, &c. *B B* are the boxes in their place. *D* is the convex lens watch-crystal. *E* is the adjustable entrance. *F* is the bottom board, that can be let down by detaching the hook *h*, forming an entrance to the hive. *G G* are the doors. *P* is a plug closing the winter ventilator to the upper apartment. *S* is a slide. *T* is the cover or top board. *a a* are entrances to be opened at certain times. *e e* are the supporters of the comb. *o o* are passages from the lower apartment to the boxes, dimly seen in the cut. *v v* are ventilators. *d* is a screw by which the lens *D* is adjusted.

The distinctive advantages of this hive are: First, It gives the apiarist complete control of the queens, without disturbing the comb or the working bees.

Second, It has an entrance capable of such an adjustment by means of a convex lens, that the vapor or breath of the bees will congeal during the coldest weather upon the inner surface, which prevents their escape and consequent destruction until a change of temperature shall remove all danger; the hive thus regulating itself, according to the state of the weather.

Third, It is ventilated in such a manner, that the air strikes the glass lining in the summer, and prevents the melting away of the comb. The chambers may also be lined in the same manner, with a ventilator at the top, by which, in winter, the vapors and other exhalations of the bees may freely escape. There is also a false cover, so constructed that a quantity of candy may be arranged for the sustenance of the bees, when a severe winter or other cause shall have reduced the supply of honey.

Fourth, It is so constructed that the cold air from the ventilators cannot directly reach the inside of the hive.

Fifth, It is so constructed that the bees may cluster in the centre, or pass to any cell within the hive, without traversing the outside, or crossing broad ranges of comb, which often saves them, in cold weather, from destruction.

Sixth, With the aid of these improvements, the drones may be removed from the hives with the least amount of trouble.

THE BEE-MOTH OR MILLER.

WE will now proceed to show the reader a most effective method of destroying this insect. It consists of an instrument or apparatus which we shall denominate the "Moth Killer."

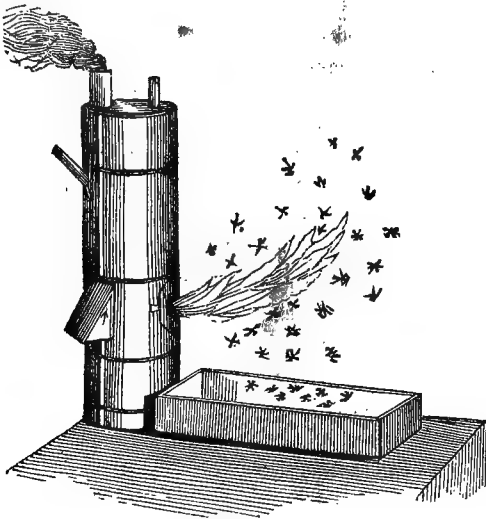


FIG. 2.

Various attempts have been made to prevent the ravages of this most destructive insect, the great foe of the apiary, through whose agency are frequently sacrificed the pleasures and the profits of an interesting department of rural economy. This insect, on account of its diminutive size, is enabled to pass through the smallest openings, and this circum-

stance has rendered the majority of the so-called "Moth-traps" nearly worthless.

The fact, however, that the moth-miller is most active in the night-season, when the bees are always quiet in the hive, has led to the practice of placing lamps or candles within the bee-houses, at a short distance from the hives. This plan, though partially effective, was liable to many objections, and finally abandoned altogether. For instance, the flame of a single lamp or candle was so slight and powerless, that it often only partially crippled the insect, by singeing off the ends of its wings, leaving it to creep into the hive, deposit its eggs, and thus perform all the mischief of which it was at any time capable. A second objection to this method consists in the smallness of the wick, and the constant liability to sudden extinguishment by gusts of wind, or the propensity of the miller to plunge into the blaze. There has been no method discovered, whereby the flame may be protected from the wind, as the use of a screen, whether of gauze, glass, or any other substance which could break the force of the wind, would obviously defeat the very purpose sought. These objections, together with others of less moment, have gradually brought this method into disuse.

We have, however, succeeded in completing an invention which is liable to none of these drawbacks. Its advantages are, briefly: First, the flame is protected from the fiercest blasts of wind, and is so arranged that no miller can by any means reach the wick; neither of these circumstances in the slightest degree impairing the efficiency of the instrument.

Second, the flame is large, powerful, and more intense than can be produced by any ordinary method; it is also thrown into a horizontal direction, so that a vessel of liquid may be placed beneath, to receive the dead millers and those which may have been only partially disabled. We are able, also,

to produce an odor, by burning a certain composition, which readily attracts the millers from all parts of the apiary.

As we have given directions in the former part of this Manual for making the cheap hives, the reader may perhaps infer that such are best adapted to the wants of the bees; but we have only given them for the benefit of those who desire to use the common kind; and for the convenience of those who wish to prevent any swarming, we have attached to our hive Weeks' Patent Ventilator, collateral boxes, chambers, and canal bottom board, of which we have purchased the exclusive right. The canal bottom board should be used on all hives, as it is undoubtedly the best ever constructed. To give the reader a proper idea of our non-swarming hive and canal bottom board, we here annex an engraving of each.

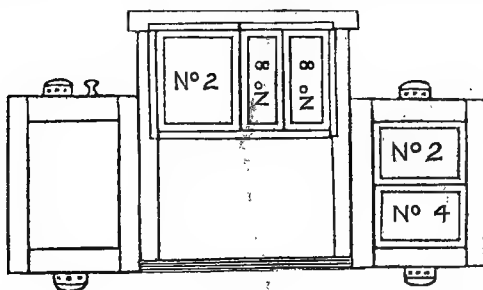


FIG. 3.

Figure 3 represents a vertical section of the Vermont Hive, with collateral boxes attached, by which the bees can be prevented from swarming, if desirable; or permitted to do so, at pleasure, by simply removing the collateral boxes. This hive should properly stand upon the canal bottom board.

Figure 4 represents the canal bottom board, ventilator, &c., to which reference is made in this Manual. It is made of plank, at least two inches thick, two feet long and sixteen

or seventeen inches in width, so as to form a shoulder for the collateral appendages to rest upon at the outside of the lines W, W. At the lines A, A, A, A, from the inside of

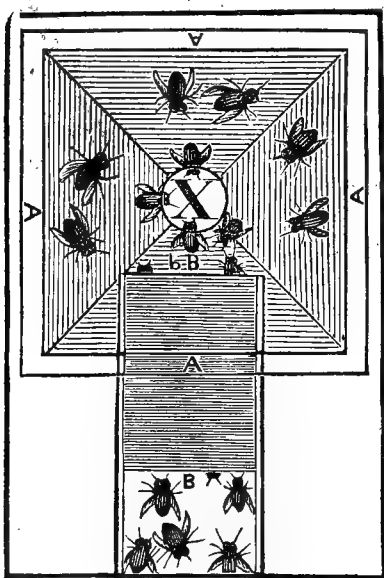


FIG. 4.

the hive's bottom, the plank is worked out into the form of a quadruple inclined plane, resembling the "hopper" of a common grist-mill. The thickness of the plank at X should be somewhat less than an inch. In the centre (at X) a hole is bored with a three-inch centre-bit, and a tin tube, two inches long, closely fitted, with six half inch holes, at uniform distances near its lower edge. This tube is confined in its place by small nails, and should extend an inch or more beyond the nether surface of the bottom board, with a lining of

wire gauze. A cover of tin is made to fit the outside of the tube, at its lower edge, with half inch holes to correspond, by the proper adjustment of which, a perfect ventilation may be secured. A canal or gutter is made upon the top of the bottom board, six inches wide and one deep, into which is fitted a board from B to bB, so as to form a passage six inches wide and one-fourth of an inch high, for the ingress and egress of the bees while at work. This entrance may be so constructed by fitting in a billet of wood as to leave room for passing bees, in proportion to their numbers. Hives should be made perfectly true on the bottom, to fit the bottom board. A thick coat of lime paste should be placed upon the bottom board, A, A, A, A, Figure 4, to make a perfect joint between that and the hive; moreover, the caustic nature of the lime is so unfriendly to life in most insects, that no moth eggs will ever hatch there. The sides of collaterals and hives, as well as all other appendages, should be whitewashed with lime where they unite; also cracks and open joints should be filled with it. We never could discover a moth-miller perched upon a place in the apiary to remain long, when it had been whitewashed within six months.

Avoiding all voluminous details, we have endeavored in this work to present to the public, in a concise yet lucid manner, some of the leading principles of this highly interesting science, and in this way to furnish at a low rate information which, though indispensable, the costliness of the larger books has placed beyond the reach of many. How far we have succeeded, not ourselves must determine, but those who shall hereafter be kind enough to give our pages an attentive perusal.

BEE-MEN, your attention is respectfully called to the fact, that the VERMONT CRYSTAL PALACE, or FLANDERS' PATENT BEE-HIVE, and MACHINE FOR KILLING THE MOTH-MILLER, are winning golden opinions from apiarians in the several States where they have already been introduced. They combine new and original principles, whose application to the culture of bees will, it is believed, entirely remove those formidable difficulties which have rendered this interesting pursuit of such doubtful utility. Testimonials from those who have thoroughly tested their merits will be furnished to those who desire them, and will enclose a letter-stamp to pay the return postage. Copies of the Manual may be had at our office, on the most reasonable terms.

We are now prepared to sell Rights, including Weeks' Patent Hives, together with our latest improvements, at the following rates, according to the quality or value of the territory :—

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